SOLA II Flare

Sulfur Online Analyzer

User Manual

PN 90-1312-0

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

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SOLA II Flare

Sulfur Online Analyzer

User Manual

PN 90-1312-0

Revision A

CRRM0000006

Revision History

Revision Level	Date	Comments
A	03-2015	Initial Release per ERO 8626

Contents

CRRM0000010

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Safety Information & Guidelines

This section contains information that must be read and understood by all persons installing, using, or maintaining this equipment.

Safety Considerations

Failure to follow appropriate safety procedures or inappropriate use of the equipment described in this manual can lead to equipment damage or injury to personnel.

Any person working with or on the equipment described in this manual is required to evaluate all functions and operations for potential safety hazards before commencing work. Appropriate precautions must be taken as necessary to prevent potential damage to equipment or injury to personnel.

The information in this manual is designed to aid personnel to correctly and safely install, operate, and maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel. The procedures in this manual are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this manual must be read and understood prior to working on or with any part of the system.

Failure to correctly perform the instructions and procedures in this manual or other documents pertaining to this system can result in equipment malfunction, equipment damage, and/or injury to personnel.

Safety Summary

The following admonitions are used throughout this manual to alert users to potential hazards or important information. Failure to heed the warnings and cautions in this manual can lead to injury or equipment damage.

Warning Warnings notify users of procedures, practices, conditions, etc. which may result in injury or death if not carefully observed or followed. The triangular icons with warnings vary depending on the hazard. ▲

Caution Cautions notify users of operating procedures, practices, conditions, etc. which may result in equipment damage if not carefully observed or followed. ▲

Caution Static sensitive component. Appropriate handling precautions required to prevent damage. ▲

Note Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ▲

Safety Operating Information

This section contains general safety and operating information applicable to analytical systems, which must be understood by all persons installing, using, or maintaining the analyzer system. This information is designed to aid personnel in the safe installation, operation, and service of the analyzer and sample systems. It is not designed to replace or limit appropriate safety measures applicable to work performed by personnel. Any additional safety and operating measures that are required must be determined by and followed by personnel performing work on the system.

Caution Failure to heed the following information may lead to equipment damage or injury to personnel. ▲

Protective eyewear (glasses with side shields or goggles as appropriate) must be worn when servicing any part of the analyzer or sample system. When servicing the sample system, chemical resistant gloves appropriate for the materials in the system must be worn. When servicing the hot analyzer oven, internal components (e.g., detectors), or hot sample system components, appropriate gloves must be worn. Heated components should be allowed to cool before servicing if possible. Other appropriate equipment or clothing must be used as required by the type of work performed.

Caution Ovens, internal components, and sample systems may be hot even when power is not applied to the unit. Take appropriate precautions to prevent injury resulting from contact with hot items. ▲

All applicable regulations and procedures must be followed for the work performed. Before beginning any work on the system, carefully consider all the potential hazards and ensure that appropriate measures are taken to prevent injury to personnel and damage to equipment.

Electrical Power

The system uses AC power at 110 Vac (an optional step-down transformer is available for 220 Vac). The AC power is converted to DC at several voltage levels. Appropriate precautions must be taken to prevent sparks present in the analyzer environment that may ignite combustible materials. Precautions must also be taken to prevent electrical shock if the analyzer or sample system enclosures are opened.

The AC power to the system must be free from noise, surges, sags, and spikes for proper system operation. AC power circuit breakers and wiring must be sized properly for the required current. All wiring installations must meet applicable electrical codes.

The fuse is located on the analyzer terminal block.

Caution If it becomes necessary to replace the fuse, it must be replaced with one of the same rating: Fuse, 3 A S/B (p/n TE-4510). ▲

Warning Remove power prior to performing any work internal to the instrument. An override is available for use in non-hazardous areas; however, removal of components while the instrument is energized is not permitted. ▲

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Chapter 1: Product Overview

The Thermo Scientific SOLA II Flare sulfur online analyzer combines proven detection technology, easy-to-use, menu-driven software, and advanced diagnostics to offer unsurpassed flexibility and reliability. The instrument offers field programmable ranges, high sensitivity, total sulfur measurement, fast response time, linearity through all ranges, and low consumables.

Function

Major components of the SOLA II Flare include a sample injection valve, carrier gas flow control system, mixing chamber, pyrolyzer, and a pulsed ultraviolet fluorescence (PUVF) detector.

The SOLA II flare is a single assembly with one software program and one user interface. The SOLA II Flare is a specialized version of the widely used SOLA II total sulfur analyzer. The SOLA II Flare is specially configured to accommodate the wide variety of sample conditions that can be experienced when monitoring flare systems, and is suitable for analyzing over a dynamic range of 10 ppm to 100% sulfur by volume using a single analyzer system.

To meet this dynamic measurement range, the SOLA II Flare uses dual PMT (photomultiplier tube) power supplies and dual sample injection valves to achieve two independent measurement ranges. The low measurement range is configured as 1% of the high measurement range. For example, a high measurement range of 50% (500,000 ppm/v) will set the low range at 5,000 ppm/v. The SOLA II Flare software will automatically select the appropriate measurement range based upon the sulfur output level being measured and will select the appropriate PMT power supply and sample injection valve for the measurement range.

The PUVF (pulsed UV fluorescence) detector utilizes a PMT to measure the SO_2 present in the measuring cell. The sensitivity of the PMT is adjusted by the supplied voltage. Using dual power supplies allows the sensitivity of the two measurement ranges to be set independently. By utilizing two sample injection valves, the SOLA II Flare provides precise control of the amount of the sample that is injected as well as control of the dilution ratio (typically 100:1) between the two injection valves. For the low measurement range, a 100 µl sample loop is used and for the high measurement range a 1 µl sample loop is used. This allows approximately the same amount of total sulfur to be injected into the detector no matter which measurement range is in use.

These two features provide complete flexibility within a single analyzer system. The lower detectable limit for the low measuring range is based upon the high range selected; for example, if the high range is set to 1,000,000 ppm (100%) the low range is automatically fixed at 10,000 ppm (1% of full scale). This would dictate a lower detectable limit on the low range of 100 – 200 ppm depending upon the final set-up used.

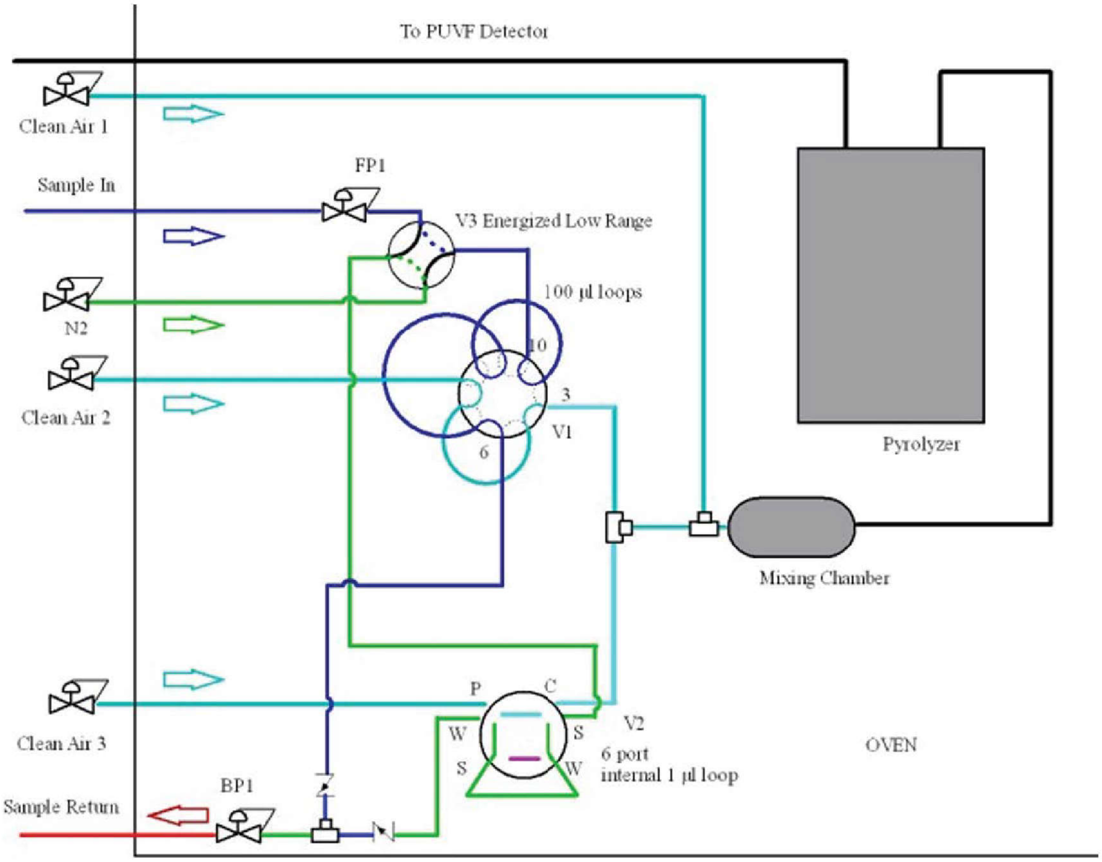

Figure 1-1. Typical SOLA II Flare analytical oven flow diagram

Set-up and programming of the SOLA II Flare is easy using the front panel display. When compared to a zinc-continuous lamp, the Xenon flash lamp in the SOLA II Flare has a cooler operating temperature. This allows for a longer lifespan of the lamp, as well as increased sensitivity to the high energy generated when the lamp pulses. The PUVF detector uses a 120-second rolling average that updates the output every second, providing an excellent response time to process changes.

The potential interferences to any UVF or PUVF detector, CO_2 and water vapor, are formed during the combustion process required to convert the sulfur compounds to SO_2. The PUVF detector utilizes reflective band-pass filters to optimize the light wavelength used for the excitation of the SO_2 molecules in the temperature-controlled measuring chamber. This optimization of the light wavelength eliminates the CO_2 interference.

Oxidative Pyrolysis System

When measuring total sulfur with a PUVF detector, it is necessary to convert 100% of the sulfur compounds present in the sample to SO_2. The combustion system is a design unique to Thermo Scientific and allows the SOLA II Flare to achieve the required conversion of all of the sulfur compounds to SO_2. The combustion system uses no catalyst to complete the conversion, and the simple U-shaped quartz reaction tube is inexpensive and easily changed (normally every 14 to 18 months). The 100% conversion is accomplished while maintaining full-scale linearity and repeatability.

The SOLA II Flare utilizes two air-actuated microliter injection valves to precisely control the amount of sample injected into the zero grade air carrier gas. For gaseous samples, a backpressure regulator allows the pressure (sample volume) to be held constant in the sample loop of the injection valve. Since the sample heads of the injection valves are inside the analytical oven, the temperature variable is eliminated. The sample passes into a mixing chamber where the hydrocarbons and sulfur compounds are mixed with the oxygen in zero-grade air. The thoroughly mixed gases flow into the pyrolyzer furnace, where the oxygen present in the carrier air is used to combust the sample and convert the carbon and sulfur compounds to CO_2 and SO_2, respectively. A small amount of water vapor is created during the combustion process, but as the amount is so negligible, it is of no concern to the PUVF detector.

Diagnostics and Communication Options

The SOLA II Flare offers a comprehensive diagnostics and communications package as a standard feature. The communications package offers the user a wide variety of options, from analog and contact closure communications, to Modbus-based communications over Ethernet- or RS485-based communications.

The SOLA II Flare also provides a comprehensive diagnostic package designed to minimize down time and provide useful troubleshooting information. Several diagnostic points are continually monitored and will trip the global alarm. The monitored points are:

- Low detector (carrier) flow
- Low detector temperature
- Lamp voltage change
- Low pyrolyzer temperature
- Low analytical oven temperature
- Purge failure
- Injection valve failure

Dynamic Range Switching

During non-flaring times, the SOLA II Flare operates using the low measurement range. When operating in the low measurement range, the analyzer uses the low-range sample injection valve, which has a 100 µl sample loop. When a flaring event with high sulfur content occurs, the first injection using the 100 µl sample loop will most likely over-range the analyzer detector. Therefore, an external trigger can be utilized to immediately switch the SOLA II Flare to the high measurement range and prepare the analyzer for the increased level of sulfur. The high range sample injection valve has a 1 µl sample loop. Options for an external trigger include a flow meter, a pressure transmitter, or the water seal level system. Once the analyzer is in the high measurement range, the increased sulfur level will not over-range the analyzer detector and the sulfur level can be tracked during the flaring event. If the external trigger is not used, the SOLA II Flare recovers within five to seven minutes and no external action is required to resume normal operation.

There is the possibility that a flaring event can occur where the overall sulfur content does not increase. For these situations, there is a user-definable dwell time associated with the external trigger. Once the external trigger tells the analyzer to switch to the high range, the analyzer will monitor the sulfur level for a programmed period, typically 5 to 10 minutes, to confirm that the sulfur level is increasing. If the sulfur level does not increase at the end of the dwell time, the SOLA II Flare will automatically switch back to the low measurement range.

During the dwell time, the SOLA II Flare is in the high measurement range but could be reading low sulfur number if the sulfur level is not increasing. During this short period, the analyzer's accuracy will be poor but a sulfur number will be reported.

Validation

The validation function can be performed with a preset time in the software or on demand. This function is a programmed sequence and once activated the SOLA II Flare will complete the sequence and report the data for the validation. To meet the daily reporting requirements, the validation should be done on a timed basis controlled by a third-party PLC. The on-demand function, which can be activated via the front panel or the PLC, should be used to determine if there is a problem with the analyzer system. For further information, see Validation.

Calibration

Calibration should be performed after a validation failure. For further information, see Calibration.

Principle of Operation

The detector is based on the principle that SO_2 molecules absorb UV light and become excited at one wavelength, then decay to a lower energy state and emit UV light at a different wavelength. Specifically,

$$SO_2 + hv_1 \longrightarrow SO_2^* \longrightarrow SO_2 + hv_2$$

$*$ = Excited state
hv_1 = Exposure light at excitation wavelength
hv_2 = Emitted light at emission wavelength

The sample in and sample out are routed into the oven through a heat traced line. The traced bundle enters through a hole in the oven and a heat shrinking boot, typically provided by the system integrator. The sample is mixed with air and passes through a pyrolyzer furnace that oxidizes the sulfur molecules in the sample to produce SO_2. The sample then flows into the fluorescence chamber, where pulsating UV light excites the SO_2 molecules. The condensing lens focuses the pulsating UV light onto a mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths that excite SO_2 molecules.

As the excited SO_2 molecules decay to lower energy states, they emit UV light that is proportional to the total sulfur concentration in the sample. The bandpass filter allows only the wavelengths emitted by the excited SO_2 molecules to reach the PMT, which detects the UV light emission. The photo detector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source to provide compensation for fluctuations. The measured SO_2 concentration, representing the total sulfur in the sample, is processed, displayed on the front panel display, and sent to the analog outputs.

PUVF Detector

The PUVF detector includes and controls the following:

- UV pulsed light and associated systems
- Reaction chamber temperature control
- Digitizing of the PMT signal
- Smoothing of the measurement signal using the moving average

Pyrolyzer

Measuring total sulfur with the PUVF detection method requires the conversion of all sulfur compounds in the sample to SO_2. This is typically accomplished with the pyrolyzer, an electrically heated furnace designed by Thermo Scientific. The pyrolyzer typically operates at a temperature of 1100°C (2012°F) to oxidize sulfur without the need for a catalyst.

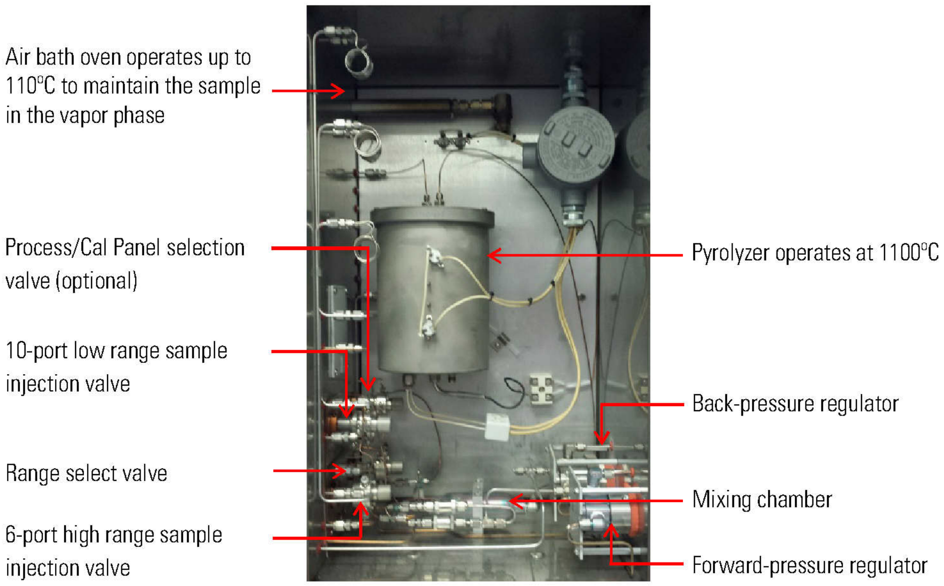

Figure 1-2. Pyrolyzer

Injection Valve

Using two sample injection volumes (low range 100 µl sample loop / high range 1 µl sample loop) to achieve the 100:1 dilution ratio allows approximately the same amount of sulfur to the detector when operating at the high end of both measuring ranges.

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Mixing Chamber

The mixing chamber mixes the sample and air before they enter the pyrolyzer.

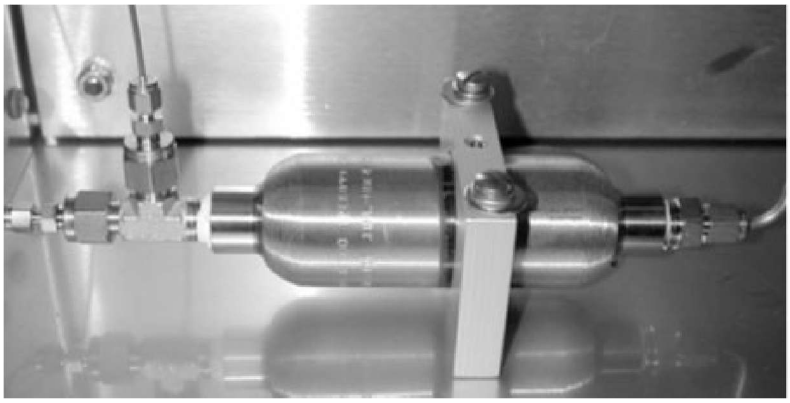

Figure 1-3. Typical mixing chamber

Dual Measuring Range

All SOLA II Flare systems utilize a dual measuring range configuration. The dual ranges are achieved by using two sample injection valves to achieve a 100:1 dilution ratio. The two injection valves allow for two completely separate measuring ranges in the PUVF Detector.

- The Low Range uses a 10-port sample injection valve with a 100µ sample loop and the low measurement range calibrated in the detector.
- The High Range uses a 6-port sample injection valve with a 1µ sample loop and the high measurement range calibrated in the detector.

The results of the sulfur concentration level being measured by the SOLA II Flare are selected by the auto-ranging function.

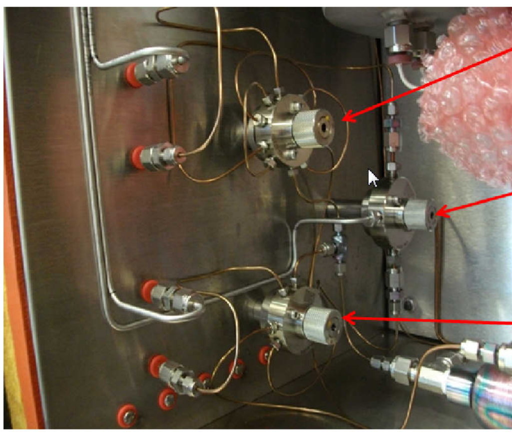

Figure 1-4. Dual inject valves (Valco) w/o calibration valve in oven

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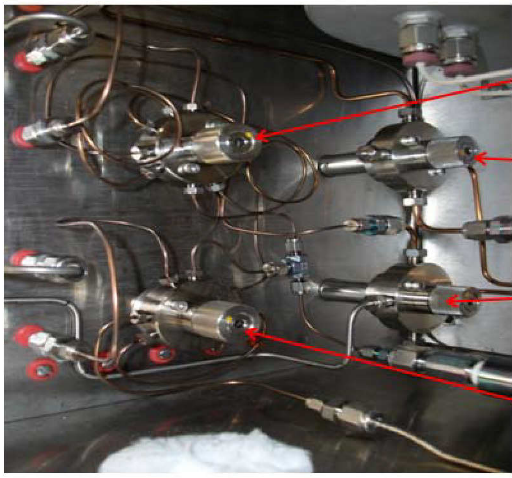

Figure 1-5. Dual-inject valves (Valco) w/ calibration valve in oven (optional)

Dual PMT Power Supplies

A dual PMT power supply is used in the SOLA II Flare. This lets the user set the sensitivity of the PUVF detector and allows the appropriate measuring range to be automatically selected by the analyzer software.

Figure 1-6.

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During initial setup and calibration of a SOLA II Flare, the optimum PMT supply voltage is set so that the highest concentration expected produces a signal that is within the range that the rest of the electronics can process. The voltage applied to the PMT is a negative dc voltage, and the lower the PMT voltage the greater the sensitivity of the detector.

The Dual PMT Supply option adds the capability of two independent analytical calibrations. During setup and calibration, supply A is assigned to one range and supply B to the other. The voltage on each supply is adjusted using the corresponding PMT voltage adjustment to accommodate the desired range. The analyzer is then calibrated and tested for each range. During normal operation, the supply voltage to the PMT is routed from either supply under software control.

Specifications

Analytical Specifications

Table 1-1.

Detector	Pulsed UV Fluorescence (PUVF), with pyrolyzer for Total Sulfur Measurement as SO_2
Repeatability	Two sample injections/minute = ± 1% of full scale at one standard deviation. One sample injections/minute = ± 2% of full scale at one standard deviation.
Linearity	± 1% of full scale measurement range
Response Time	Semi-continuous, 120-second rolling average with the output updated each second, T-90 response time of four to seven minutes
Process Streams	One
Calibration	On-demand
Validation	Automatic or on-demand

Analog/Discrete Data Communications

Table 1-2.

Analog Outputs	Two 4–20 mA dc outputs, one assigned to each range
Alarm Outputs	One (1) global dry contact triggered by one or more of the following: Low detector flow alarm Oven/pyrolyzer temperature fault Injection valve fault Purge failure Detector temperature fault Detector lamp voltage fault One (1) out of service dry contact triggered by: Analyzer in validation Suspension of analyzer
Digital Data Communications	Dual channel RS-485 Modbus, TCP/IP Ethernet via Modbus, TCP/IP encapsulated Modbus & RS-485 Modbus
Local HMI	Status of all analyzer parameters (e.g. pyrolyzer furnace and analytical oven temperatures, PMT and lamp voltages, detector flow rates, etc.) and analytical results available on the front mounted displays, push button menu access; hazardous area classification remains intact while operating the local display
SOLA II Flare Modbus Interface	Complete remote control of SOLA II Flare, automatic logging of analysis results and analytical parameters, communication to SOLA II Flare via serial or TCP/IP encapsulated Modbus enables remote diagnostics via modem
SOLA Web Remote Interface	Complete remote control of the SOLA II Flare, ability to download 24 hours of analysis results and analyzer parameters, communications to the SOLA II Flare via local area network (TCP/IP) enables remote diagnostics via modem. The Flare SOLA Web is limited to the replica of the front display on the SOLA II Flare.

System Requirements/ Dimensions/Area Classifications

Table 1-3.

Ambient Temperature	54 to 104 def. F (12-40 deg. C) Ingress Protection IP-51/dustproof and dripping water
Input Voltage	110VAC, optional 220VAC to 110VAC Step Down Transformer
Power	20 amp circuit recommended; 17 amp maximum during warm-up cycle; 7-8 amps once operation temperature achieved
Dimensions	
Zone 1 Div. 1 Configurations	1581.15 mm (62.25 in) high x 647.70 mm (25.50 in) wide x 476.25 mm (18.75 in) deep
Zone 2 Div. 2 Configurations	1104.39 mm (43.48 in) high x 647.70 mm (25.50 in) wide x 476.25 mm (18.75 in) deep
Available Certifications	
	CSA/US: Class I, Div 2, Groups B, C & D, T3
	CSA/US: Class I, Div 1, Groups B, C & D, T3
	ATEX: Zone 2, 3 G Ex pz IIC T3

System Requirements

Table 1-4.

Ambient Temperature	54 to 104°F (12 – 40°C) Ingress Protection: IP-51 / dustproof and dripping water
Power	110 Vac (optional 220 Vac), 50/60 Hz at 2000 watts /±10 volts 20-amp circuit recommended; 17 amps maximum during warm-up cycle; 7-8 amps once achieving operational temperatures
Available Certifications	CSA/NRTL Class 1, Division 2, Group B, C & D (standard) CSA/NRTL Class 1, Division 1, Group B, C & D (optional)
System Configuration	Dimensions: 44"H x 26"W x 18"D 1118H x 660W x 457D mm Weight: 250 lbs (estimated) 114 kg (estimated)

Site Requirements

The customer is responsible for installation of the analyzer system including all sample, vent, utility electrical and signal connections. The installation should be completed prior to a Thermo Scientific service technician's arrival at the analyzer location.

Table 1-5.

Analyzer Sample Vent	No backpressure may be applied and the PUVF Detector sample vent – the vented gases will contain CO_2, H_2O and high levels of SO_2.
Sample	The suggested sample input pressure is dependent upon the type of sample and therefore is application dependent. For most flare applications the sample delivered to the SOLA II Flare needs to be in the 25-30 psig range.
Carrier & Auxiliary Air	Air Carrier Gas (Zero grade air) Minimum input pressure is 80 psig. The air used as a carrier gas must be clean, dry and sulfur free. Cylinder air is recommended to obtain this quality. Consumption is 250-300 cc/min.
Instrument Air (Operational)	Minimum input pressure 60 psig. The instrument air must be clean, dry and oil free. Instrument air is required for both the cabinet purge and the µl injection valve. Consumption is 6-7 SCFM.
Nitrogen (Sweep Gas)	Minimum input pressure 60 psig. The nitrogen must be clean, dry and oil free. nitrogen is required for sweeping the unused valve only. Consumption – when required.
Power	120 Vac - 50/60 Hz The power supply to the analyzer system should be stable within ±10 volts

Spare Parts

Table 1-6. SOLA II Flare spare part kits

Part Numbers	SOLA II Flare - Spare Part Kits Valco Vapor Sample Injection Valve	Start Up	One Year	Two Year	Critical Operation
	Kit Part Numbers	97-1589-DI	97-1589-DI1	97-1589-DI2	97-1589-DIC
	Items Included in Kits	Qty	Qty	Qty	Qty
HA-101812	Ferrules for pyrolyzer reaction tube fittings, graphite	4	4	8	0
30-1025-0	Pyrolyzer tube, looped	2	1	2	0
63-1135-0	Pyrolyzer O-ring, 5 5/8" I.D. x 5 7/8" O.D., 1/8" width	2	2	4	0
27-1108-0	Thermocouple, pyrolyzer, S type	0	1	1	0
29-1230-0	Heater element for pyrolyzer assembly	0	1	2	0
47-1362-0	Filter - clean air, in-line 2 micron filter assembly	0	1	2	0
47-1645-0	Filter - sample, in-line 0.5 micron filter assembly - Sulfinert®	0	1	2	0
75-1340-0	Valve, complete 10-port for vapor samples	0	0	1	1
75-1332-0	Valve, complete 6-port for vapor samples	0	0	1	1
75-1355-0	Rotor, vapor sample, 4 pt	1	1	2	0
45-1835-0	Rotor, vapor sample - low range, less external sample loops; 10 pt	2	4	8	0
45-1823-0	Rotor, vapor sample - high range, 1.0 µl, 6-pt	2	4	8	0
75-1333-0	Valve Head, 6 pt	0	0	1	0
75-1343-0	10-port valve head - less sample loops	0	0	1	0
63-1158-0	O-ring kit for valve actuator	0	2	2	0
45-1871-0	Regulator - Forward; Sulfinert® coated - 0-25 psig	0	0	0	1
45-1872-0	Regulator - Back-pressure - 0-25 psig	0	0	0	1
TE-8666	PUVF replacement Xenon flash lamp	0	0	1	1
TE-57P713-1	PUVF Bench - Standard / complete	0	0	0	1
89-2839-0	Pyrolyzer Assembly - complete	0	0	0	1
TE-8949	PUVF Power supply PCB	0	0	0	1
TE-8774	PUVF Trigger Pak - Regular Bench	0	0	0	1
TE-9681	PUVF Flasher supply PCB	0	0	0	1
89-2898-0	I/O PCB	0	0	0	1

Storage

If storing the instrument, the storage environment should be protected and free from extremes of temperatures and high humidity.

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Chapter 2: Installation

Requirements

- Material and power: Consult the specifications for installation information.
- Operating environment: For optimum reliability and equipment life, we recommend that the analyzer be installed in a location protected from temperature and weather extremes. The analyzer operates best in a controlled environment. Ambient temperature and purge air must not exceed the limits listed in the specifications.
- Mounting requirements: The mounting site must be as close as possible to the sampling point. The analyzer must be sheltered from extreme weather conditions. Avoid mounting the analyzer in high vibration areas. Mount the analyzer in an accessible location.
- Cable glands used to supply electrical power must be IP40 rated metallic cable glands.
- Blanking elements or plugs used shall be in accordance with national standards.

Caution This product is extremely heavy. Care must be taken at all times to avoid injury. Never attempt to move this product alone or without the use of lift gear. When handling the analyzer, ensure that all four corners are supported. ▲

Sample Line Installation

Note Sample lines into the SOLA II Flare must be heat-traced due to the potential of high dew-points. ▲

There must be no back pressure on the vent or drain lines. All vents must be referenced to atmospheric pressure. If the analyzer is installed in a pressurized analyzer shelter, route all vents from the purge controllers and the PUVF detector to the exterior of the shelter. All sample lines must be as short as possible. Sample lines must use pre-cleaned, pre-treated Sulfinert® tubing.

The analyzer will produce erratic readings if backpressure is created or varied by an obstructed or improperly routed vent.

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Electrical Connections

Refer to the following ac power and wiring information when planning and connecting power for the analyzer.

- Power source specification: 110 or optional 220 Vac, 50/60 Hz, 2000 W
- Power wiring specification: Use stranded, three-wire copper or tin-plated copper power wire rated for at least 600 Vac and 20 A at the required length.

Warning This apparatus must be earth grounded. ▲

Warning Installation of this instrument requires an external, lockable electrical power isolation switch supplied by the customer. ▲

If the optional X-Purge unit is installed, refer to Appendix F for important installation and operation information.

Wiring to the relay contacts should be sized according to the load imposed by the alarm systems installed by the user. Maximum current capability of the alarm contacts is 2 A at 240 Vac or 10 A at 24 Vdc. Voltage is not supplied to the relay contacts by the analyzer.

DCS & External Connections

The following inputs and outputs can be connected to a Distributed Control System (DCS) or other devices as desired.

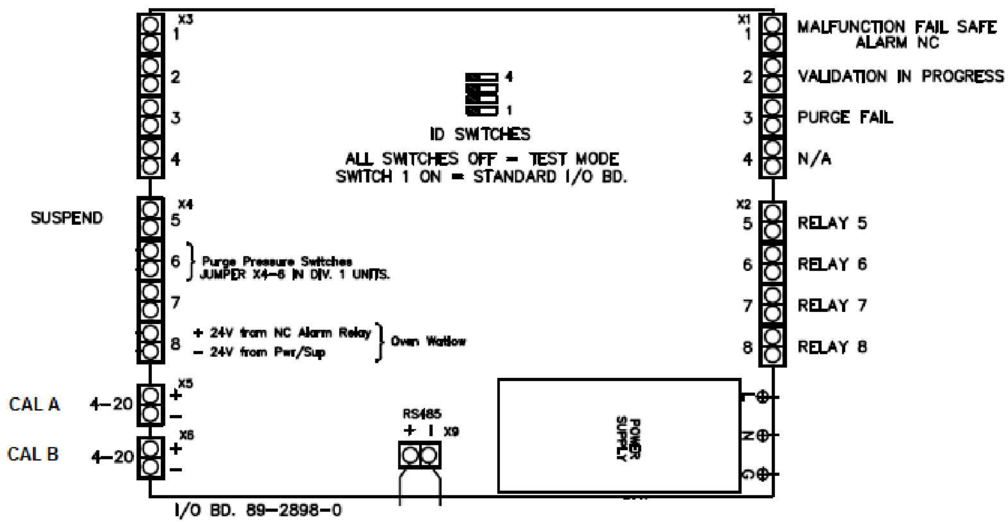

Figure 2-1.

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- Remote Suspend: To suspend analysis, short the Remote Suspend connection to the Remote Suspend common terminal. To restart analysis, open the connection across the Remote Suspend connectors. The remote control function must be enabled (Analyzer Setup).

Analog Outputs

The following outputs are available with the analyzer. See 4–20 mA Range Setup and refer to the wiring diagrams shipped with your instrument for wiring details.

- Cal A output: This 4–20 mA dc signal represents the measured concentration of Cal A. The zero value (4 mA dc) represents zero measured concentration in the sample. Full scale (20 mA dc) represents the measured concentration specified in High Range.
- Cal B output: This 4–20 mA dc signal represents the measured concentration of Cal B. The zero value (4 mA dc) represents zero measured concentration in the sample. Full scale (20 mA dc) represents the measured concentration specified in High Range.

Other Outputs

The following outputs are also provided: Alarm Relay, Validation in Process, Status Relay (fail-safe), Malfunction Alarm Relay (fail-safe, normally closed) and Purge Alarm (fail-safe).

I/O Control

The PLC or DAS connected to the SOLA II Flare drives the validation by commanding the SOLA II Flare to set the appropriate ranges for the Cal A low range and Cal B high range. The SOLA II Flare then analyzes the validation gases and reports the values to the control system.

Each gas should be run for at least 10 minutes and the data latched at the end of each period.

The sequence of validation steps will be defined by the end user.

The SOLA II Flare will provide the following I/O:

- SCS Interface
  - Up to five Pneumatic Outputs
  - Up to four Relay Dry Contact Outputs
- Validation Control
  - Two Modbus interface ports: RS-485 and either Ethernet or RS-232

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- Four Contact Inputs (Dry switches)
- Two 4–20 mA outputs (Cal A and Cal B)
- One Common Alarm Dry Contact Output
- One Contact Input (Dry switch) to force the temporary activation of the High Calibration

Note Normally there are two possible modes of validation. The local validation routes the validation gases from the switching panel to the SOLA II Flare. The remote validation routes the validation gases to the probe and back to the switching panel as the normal flare sample. ▲

Five pneumatic outputs from the SOLA II Flare can drive a sample select valve:

- Flare Sample
- Low Gas
- Mid Gas
- High Gas
- Local / Probe selection

Two Relay Outputs can be used during the probe validations to drive signals to the Probe Box

See Relays 5 and 6 on the I/O Table.

The SOLA II Flare can be commanded to select any of the following possible states:

0. Normal Flare Monitoring (auto-range)
1. Local Low Gas Cal A
2. Local Low Gas Cal B
3. Local Mid gas Cal A
4. Local Mid gas Cal B
5. Local High gas Cal B
6. Probe Low Gas Cal A
7. Probe Low Gas Cal B
8. Probe Mid Gas Cal A
9. Probe Mid Gas Cal B
10. Probe High Gas Cal B

Table 2-1. I/O Table

	Solenoid 1 Flare/V4	Solenoid 5 Low Gas	Solenoid 6 Mid Gas	Solenoid 7 High gas	Solenoid 8 Local/Probe	Rly 5	Rly 6	Rly 7	Rly 8	Cal Selected	Modbus register (4)0063 Valve Control
Flare	X									Auto Range	0
Local Low Cal A		X								Cal A	1
Local Low Cal B		X								Cal B	2
Local Mid Gas Cal A			X							Cal A	3
Local Mid Gas Cal B			X							Cal B	4
Local High Gas Cal B				X						Cal B	5
Probe Low Cal A	X	X			X	X	X			Cal A	6
Probe Low Cal B	X	X			X	X	X			Cal B	7
Probe Mid Gas Cal A	X		X		X	X	X			Cal A	8
Probe Mid Gas Cal B	X		X		X	X	X			Cal B	9
Probe High Gas Cal B	X			X	X	X	X			Cal B	10

Note The table above applies to standard SOLA II Flare units. For information on inputs and outputs on modified units, contact Thermo Scientific. ▲

Installation Checklist

The following checklist may be copied for use during system installation. Details for the installation and various specification requirements are contained in this manual, application specific drawings, and information supplied with the instrument.

- ☐ Materials used meet specifications defined in Chapter 1.
- ☐ Operating environment meets requirements defined in Chapter 2.
- ☐ Mounting meets requirements defined in Chapter 2.
- ☐ Analyzer condition inspected as follows:
  - ☐ No physical damage, broken parts, or observable defects.
  - ☐ All electronic boards are securely seated.
  - ☐ All cables and wiring connectors are in place and fully seated
  - ☐ No loose parts (wires, nuts, screws, cables, debris, etc.).
  - ☐ All tubing is properly connected and fittings are tight.
- ☐ Installation and flow connections adhere to the following:
  - ☐ Sample system properly designed to condition (control pressure, flow, temperature, and particulate) sample as required by system.
  - ☐ Sample system fast loop panel is installed as close as possible to analyzer for fastest response time.
  - ☐ System gases meet quality and quantity (pressure and flow) specifications according to Chapter 1.
  - ☐ PUVF vent is vented to atmospheric pressure.
  - ☐ PUVF vent is NOT connected to headers with varying pressure or that may accumulate liquids.
  - ☐ All tubing supply lines to analyzer are sized to match or exceed connector size on the analyzer.
  - ☐ All internal and external tubing fittings are physically checked for tightness and tested for leaks.
- ☐ Installation and electrical connections adhere to the following:
  - ☐ AC power wiring meets requirements.
  - ☐ AC power wiring is properly connected to the instrument with proper earth grounding.
  - ☐ Signal wiring (dc signals, communications, etc.) meets requirements.
  - ☐ Signal wires properly connected to the instrument.
  - ☐ All electrical conduit seals poured with sealing compound such as Chico A5r or equivalent.

Chapter 3: Start-Up & Shutdown

Initial Start-Up

Perform this procedure when starting up a new installation or when major service work is performed. Otherwise, perform the procedure according to the section titled Start-Up After Short-Term Shutdown.

See the application data that shipped with the instrument, and the Specifications and Installation instructions in this manual for information necessary in performing the following procedure.

1. Verify proper electrical power and connections:
   a. Ensure the instrument electrical power wiring is properly sized and connected.
   b. Ensure the power voltage and frequency matches the instrument requirements.
   c. Ensure a suitable circuit breaker and power switch is installed.
   d. Ensure the instrument is properly grounded.
   e. Inspect all electrical connections. Terminals must be snug; wire and cable plugs must be fully seated. Perform a visual check for electrical shorts.
   f. Inspect the plug-in cards; ensure they are properly seated in their connectors.
   g. Ensure the signal wiring is properly sized and connected.
2. Verify proper plumbing:
   a. Ensure the correct supply tubing is properly connected to the instrument.
   b. All sample lines to the analyzer must be cleaned and dried before initial use.
   c. Check all tubing connections to ensure they are tight and free of leaks. Pressure test the lines to check for leaks or use a liquid leak detector.
3. Apply instrument/purge air to the instrument for at least 15 minutes, and set the pressure. See application data sent with instrument for proper settings.

Warning For Zone II areas, the initial purge must be carried out only when the area is known to be non-hazardous. ▲

4. Apply power to the instrument.

Note If the X-Purge option is installed, you must follow the instructions included in Appendix F. ▲

a. Verify that temperature controllers are set as specified in the application notes shipped with the instrument or as recorded in the system logbook. Note that the pyrolyzer and oven do not begin heating immediately due to the safety interlocks.

Note The pyrolyzer temperature controller does not accurately read low temperatures near ambient; however, it does read accurately at normal operating temperatures. ▲

b. Verify that the display is functioning. Figure 3–1 appears, displaying the version and whether a valid configuration is loaded.

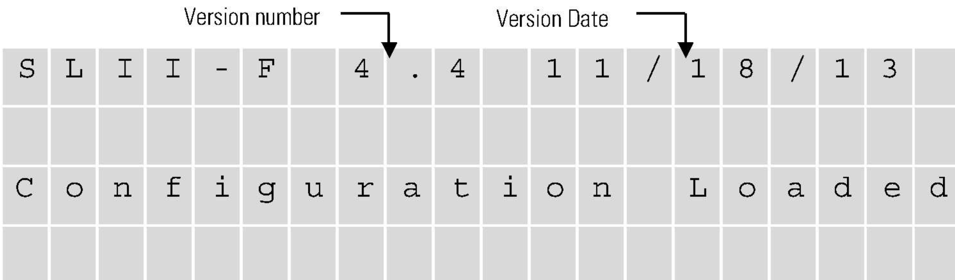

Figure 3-1.

c. Verify that the configuration settings in the menus match the application data sheet or system logbook.

d. See Suspending an Analysis to prevent accidental injection of sample while setting up the instrument.

5. Apply carrier air to the instrument, and set the flows. See application data sent with the instrument for proper settings.

a. Verify that the pyrolyzer and oven heater temperature come up to temperature and stabilize at the control point.

b. Adjust the zero/carrier air pressure and flow again after the pyrolyzer and oven stabilize at the correct temperature.

6. Turn on the sample flow to the instrument, and adjust it to the correct pressure and flow. Note that this procedure varies depending on the installed sampling system. Consult the application notes and drawings provided with the instrument for more information.

7. Enable analysis of the sample by taking the instrument out of the suspend mode. The unit begins injecting and analyzing sample when the instrument temperatures reach operating levels.
8. Allow the analyzer system to stabilize. Monitor the measured values on the front panel for consistent analysis readings to determine when the analyzer system has stabilized.

Startup After Short-Term Shutdown

If initially starting the analyzer or if major service was performed, use the initial start-up procedure detailed in the previous section, Initial Start-Up.

When starting the analyzer after a short-term shutdown, perform the following:

1. Open the instrument and purge air and carrier air to the instrument. Refer to the applications information, manuals, and drawings shipped with the instrument, and adjust the pressure regulators to the appropriate settings.
2. Apply power to the analyzer.

Note If the X-Purge option is installed, you must follow the instructions include in Appendix F. ▲

3. Allow the analyzer to warm up until the instrument stabilizes.
4. Adjust the flow rates.
5. Turn on sample to the instrument.

The analyzer includes an interlock system that prevents the injection valve from operating until the pyrolyzer and oven temperatures reach the operating value.

Short-Term Shutdown

Follow this procedure when temporarily shutting down the analyzer. To shut down the analyzer for maintenance purposes or for a long-term shutdown, refer to the following section, Maintenance Shutdown.

1. Observe reported sulfur value.
2. Do not interrupt power, instrument air, carrier or auxiliary air, or open oven doors until reported sulfur value is less than 0.5 ppm or reported sulfur value has not changed by more than 2% for 15 minutes.

Note If possible, switch sample selection to nitrogen to sweep the system. ▲

Maintenance Shutdown

The analyzer system must be fully shut down and the sample system decontaminated as appropriate prior to performing maintenance. Follow this procedure when shutting down the analyzer for maintenance or a long-term outage.

1. Close the sample flow to the instrument and purge the sample from the unit using nitrogen.
2. Turn off power to the analyzer.
3. Allow the instrument to cool.

⚠ **Caution** Failure to allow adequate cooling time before opening the oven can lead to equipment damage or injury to personnel. ▲

4. Turn off all air supplies.

⚠ **Caution** Parts of the instrument may be hot even after power is removed. Allow the system to cool completely before performing maintenance. ▲

Emergency Shutdown

1. Close the sample supply to the system.
2. Turn off the main power to the system.

SOLA II Flare Menus

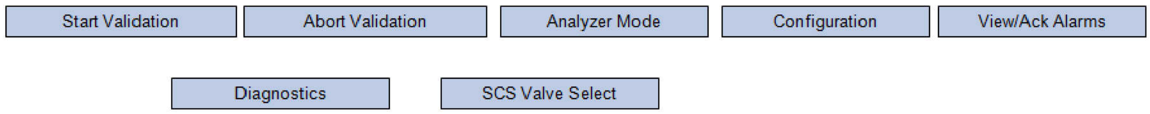

Figure 3-2. Top level menu

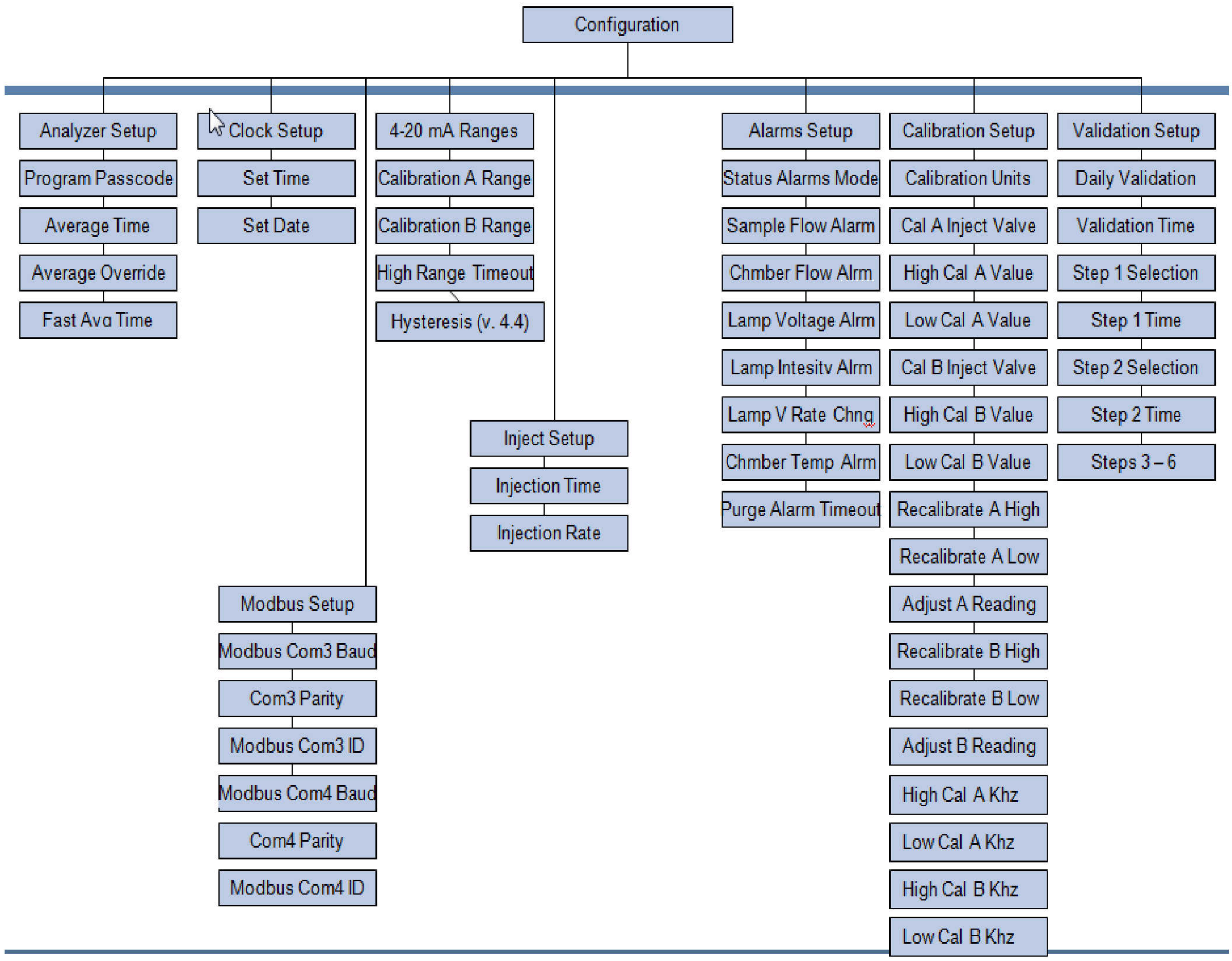

Figure 3-3. Configuration menu

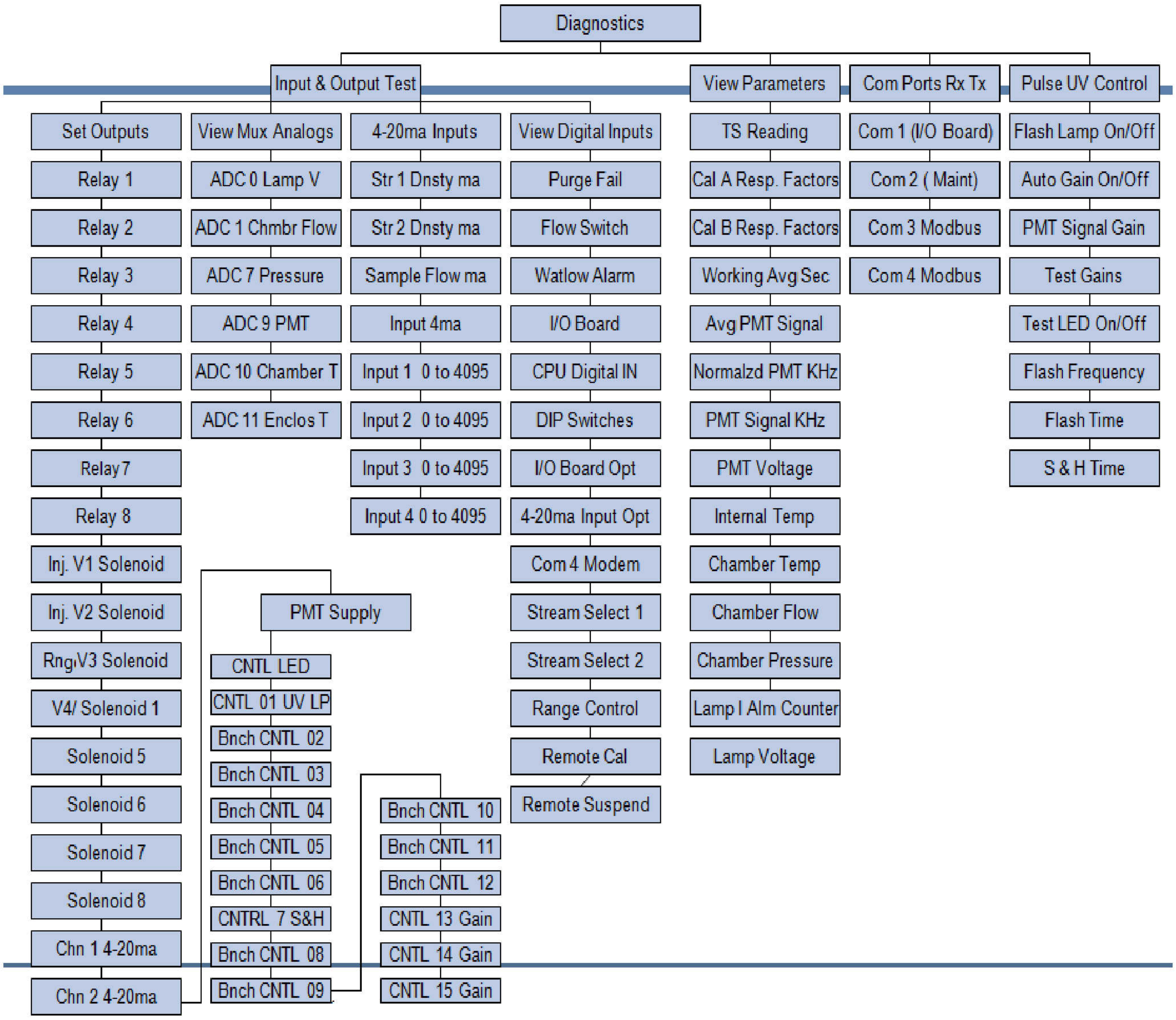

Figure 3-4. Diagnostics Menu

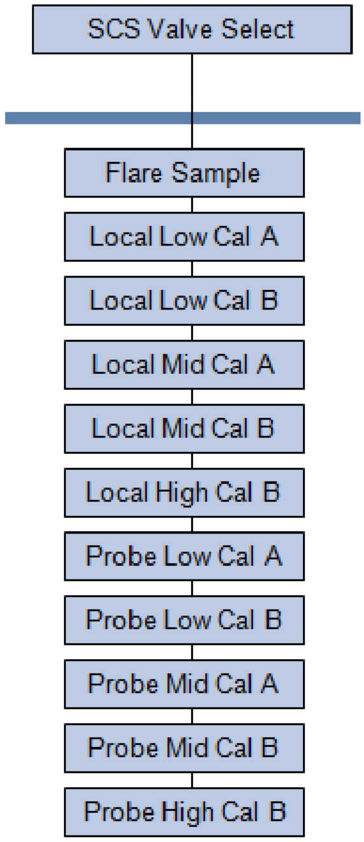

Figure 3-5. SCS Valve Select menu

The SCS Controls section of the software allows you to manually manipulate the SCS. This can be used:

1. During commissioning to ensure the SCS is plumbed correctly.
2. During recalibration.
3. At other times when it might be useful to control the SCS system.

Chapter 4: Operation

The Interface

The analyzer utilizes a 4-line by 20-character, vacuum fluorescent display and four push buttons as the user interface. All programming and adjustments are accomplished using the push buttons. Following is an example of how to use the interface to enter the passcode. For information on programming the passcode, Analyzer Setup.

1. Press any button, and you are prompted to enter the passcode.
2. Press the button below Ent (Enter).
3. To increase the first digit's value press the button below the up arrow (∧). Decrease the value by pressing the button below the down arrow (∨). When the correct number is displayed, press the button below the right arrow (>) to enter the next digit.
4. Repeat the process used to enter the first digit for the remaining digits.
5. Once the passcode is complete, press the button below Done.

You can access all program features and edit parameters by following these steps.

Note For instructions on programming the passcode, see Analyzer Setup. ▲

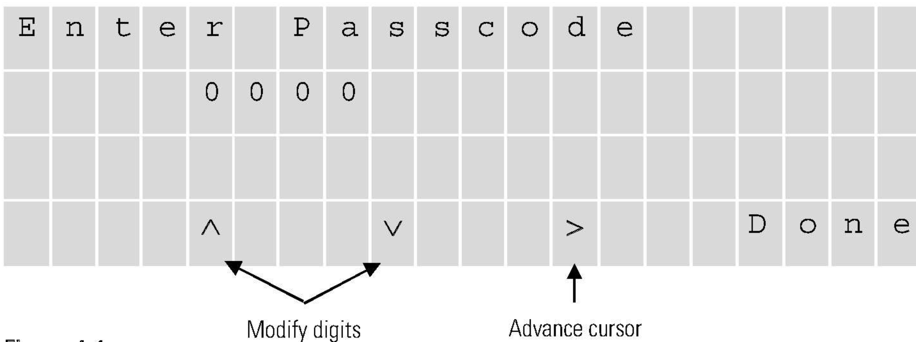

Figure 4-1.

Begin Analyzing

1. If the analyzer is shut down, start up the instrument by following the appropriate set of instructions in Chapter 3.
2. If the system power is off, open the instrument and carrier air flows to the analyzer, and adjust the pressures to the appropriate settings (refer to application data that shipped with the analyzer).

3. Open sample flow to the analyzer.
4. Apply power to the instrument.
5. Analysis begins automatically when the pyrolyzer and oven reach operating temperature. If you need to change the configuration, press any button, and enter the passcode.

Suspending an Analysis

Follow these steps to suspend an analysis.

1. Enter the Analyzer Mode top-level menu.
2. Select Suspended to suspend the analysis. In suspended mode, the analyzer stops injecting, and shuts off the air to the sampling system pneumatic and allows only air to run through the burner and mixing chamber.
3. To resume the analysis, go to the Analyzer Mode menu, and select Active.

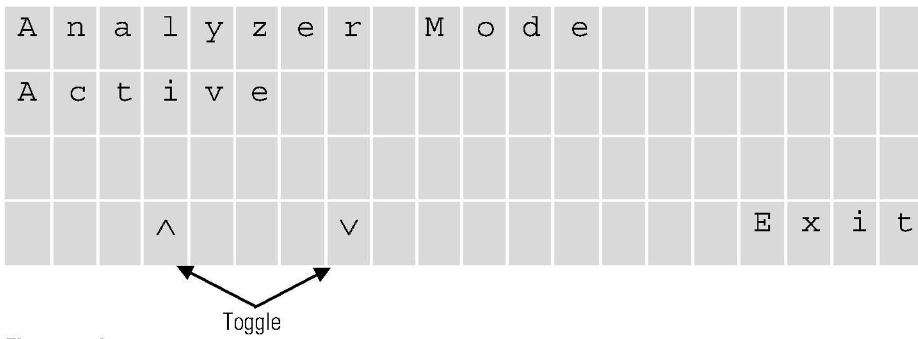

Figure 4-2.

Injection Valve Failure Alarm

Over time, the injection valves begin to wear, resulting in an increased potential for port-to-port leakage of sample. Such leakage can cause erroneous measurement and materials buildup in the system. When the analyzer detects sample leakage through the injection valve, it triggers the Injection Valve Failure alarm and stops airflow to the pneumatic valves.

Note The Injection Valve Failure alarm must be acknowledged after valve repair or replacement. ▲

If an injection valve begins leaking due to damage or wear, excess sample begins flowing to the pyrolyzer. This extra load of sample in the pyrolyzer exceeds the ability to fully combust the materials in the sample. When these incompletely combusted materials enter the PUVF optical bench, they absorb UV light.

The PUVF includes a system to monitor and compensate for decreases in the UV light output as the bulb ages. However, in the case of injection valve failure, the PUVF system begins rapidly increasing the UV lamp output in an effort to compensate for the absorption of UV by incompletely combusted sample products. The user can enter the rate of change that triggers this alarm. The programmable range is from 1 to 50 V/30 seconds. If the analyzer detects the programmed rate of change in UV lamp voltage, it triggers the Injection Valve Failure alarm to protect the system by stopping the sample injection and reducing the stabilization time for the PUVF bench on system restart.

Note This alarm can also be triggered by an electronics failure causing improper flashing of the lamp. ▲

When the Injection Valve Failure or Chamber Flow alarm activates, the SOLA II Flare stops air flow to the sampling system pneumatic valves. This prevents excess sample and incomplete combustion products from further contaminating the system. This happens under the following conditions:

- Injection failure alarm
- Instrument power loss
- Instrument air loss
- Analysis suspension

Chapter 5: Configuration

There are five top-level menus; this chapter addresses the Configuration menu. The Configuration menu contains eight setup menus: Analyzer Setup, Clock Setup, Modbus Setup, Inject Setup, Alarms Setup, Calibration, Validation Setup and 4–20 mA Range Setup.

S	L	I	I	-	F		4	.	4		1	1	/	1	8	/	1	3	
C	o	n	f	i	g	u	r	a	t	i	o	n							
		v				^			E	n	t			E	x	i	t		

Figure 5-1. Top-level configuration menu

Analyzer Setup

1. Access the submenus within the Analyzer Setup menu by pressing Enter.

C	o	n	f	i	g	u	r	a	t	i	o	n							
A	n	a	l	y	z	e	r		S	e	t	u	p						
		v				^			E	n	t			E	x	i	t		

Figure 5-2.

2. The first submenu is Program Passcode. The factory default is 0000. If the passcode remains 0000, you are not required to enter the passcode to access the menus. Change the passcode to prevent unauthorized access to the menus.

A	n	a	l	y	z	e	r		S	e	t	u	p						
P	r	o	g	r	a	m		P	a	s	s	c	o	d	e				
		v				^			E	n	t			E	x	i	t		

Figure 5-3.

3. The Average Time submenu allows you to set the averaging time. The average time is a period between 1 and 240 seconds during which the analyzer takes SO_2 measurements used to determine a moving average of the results. For example, if you set the averaging time to 10 seconds, the average concentration of the last 10 seconds is output at each update. If you set the averaging time to 60 seconds, the average concentration of the last 60 seconds is output at each update. Thus, a lower averaging time means a faster response to concentration changes. Longer averaging times are typically used to smooth output data.

   See the figure below.

A	n	a	l	y	z	e	r		S	e	t	u	p						
A	v	e	r	a	g	e		T	i	m	e								
		v				^			E	n	t			E	x	i	t		

Figure 5-4.

4. The average override is expressed as a percentage of change and determines when the unit switches to the fast average. As the reading stabilizes at the new level, the analyzer progressively increases the average used until it reaches the programmed average time.

A	n	a	l	y	z	e	r		S	e	t	u	p						
A	v	e	r	a	g	e		O	v	e	r	r	i	d	e				
		v				^			E	n	t			E	x	i	t		

Figure 5-5.

5. The fast average time provides the ability to respond to changes faster without sacrificing stability achieved using a longer average time.

Note Both the regular and fast average times need to be set at multiples of the injection rate. For example, if the rate is two injections per minute, averages should be set to 30, 60, 90, 120, 150, 180, 210, or 240 seconds. ▲

CRRM0000051

A	n	a	l	y	z	e	r		S	e	t	u	p						
F	a	s	t		A	v	e	r	a	g	e		T	i	m	e			
		∨					∧			E	n	t			E	x	i	t	

Figure 5-6.

Clock Setup

1. Access the Clock Setup menu to change the time and date.

C	o	n	f	i	g	u	r	a	t	i	o	n							
C	l	o	c	k		S	e	t	u	p									
		∨					∧			E	n	t			E	x	i	t	

Figure 5-7.

2. Using a 24-hour format, enter the time in hh:mm:ss.

C	l	o	c	k		S	e	t	u	p									
S	e	t		T	i	m	e			1	4	:	3	2	:	1	3		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-8.

3. Enter the date in mm/dd/yyyy format.

C	l	o	c	k		S	e	t	u	p									
S	e	t		D	a	t	e			0	3	/	1	1	/	1	4		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-9.

Modbus Setup

1. The Modbus Setup menu enables to you set the baud rates, parity and IDs for COM 3 and COM 4.

C	o	n	f	i	g	u	r	a	t	i	o	n							
M	o	d	b	u	s		S	e	t	u	p								
		v					^			E	n	t			E	x	i	t	

Figure 5-10.

2. Select one of the baud rates available for RS485 COM 3 (38400, 19200, 9600, 4800, 2400, or 1200 bps), or select Disable.

M	o	d	b	u	s		S	e	t	u	p								
C	O	M	3		M	o	d	b	u	s		B	a	u	d	r	a	t	e
		v					^			E	n	t			E	x	i	t	

Figure 5-11.

3. Set the parity for COM 3.

M	o	d	b	u	s		S	e	t	u	p								
C	O	M	3		M	o	d	b	u	s		P	a	r	i	t	y		
		v					^			E	n	t			E	x	i	t	

Figure 5-12.

4. Set the ID (network address) for COM 3. The address can be from 1 to 255.

M	o	d	b	u	s		S	e	t	u	p								
C	O	M	3		M	o	d	b	u	s		I	D						
		v					^			E	n	t			E	x	i	t	

Figure 5-13.

5. Set the baud rate and the ID for COM 4 in the same manner, using the submenus for COM 4.

Inject Setup

1. Enter the Inject Setup menu to set injection parameters.

C	o	n	f	i	g	u	r	a	t	i	o	n							
I	n	j	e	c	t		S	e	t	u	p								
		∨					∧			E	n	t			E	x	i	t	

Figure 5-14.

Note The SOLA II Flare is preconfigured with a standard injection time and rate. ▲

2. The injection time is the amount of time between sample injections. The rate can be from 1 to 9999 seconds.

I	n	j	e	c	t		S	e	t	u	p								
I	n	j	e	c	t	i	o	n		T	i	m	e						
		∨					∧			E	n	t			E	x	i	t	

Figure 5-15.

3. The injection rate should be set to double the injection time.

I	n	j	e	c	t		S	e	t	u	p								
I	n	j	e	c	t	i	o	n		R	a	t	e						
		∨					∧			E	n	t			E	x	i	t	

Figure 5-16.

CRRM0000054

Alarms Setup

Review the following for instructions pertaining to alarm setup.

1. Access the menu items by pressing Enter.

C	o	n	f	i	g	u	r	a	t	i	o	n							
A	l	a	r	m	s		S	e	t	u	p								
		∨					∧			E	n	t			E	x	i	t	

Figure 5-17.

2. To set up a Chamber Flow alarm, enter the set point at which the low flow alarm for the flow measured at the detector chamber in the PUVF should activate. The value can be from 0 to 1000 cc/m.

A	l	a	r	m	s		S	e	t	u	p								
C	h	a	m	b	e	r		F	l	o	w		A	l	a	r	m		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-18.

3. To set up a Lamp Voltage alarm, enter the high point lamp voltage at which the alarm should activate. The value can be from 0 to 1200 V.

A	l	a	r	m	s		S	e	t	u	p								
L	a	m	p		V	o	l	t	a	g	e		A	l	a	r	m		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-19.

CRRM0000055

4. To set up a Lamp Intensity alarm, enter the low-point lamp frequency at which the alarm should activate. The value can be from 0 to 50,000 Hz.

A	l	a	r	m	s		S	e	t	u	p								
L	a	m	p		I	n	t	e	n	s	i	t	y		A	l	a	r	m
		v					^			E	n	t			E	x	i	t	

Figure 5-20.

5. To set up a Lamp Voltage Rate of Change alarm, enter the rate of change in lamp voltage at which the alarm should activate. The value can be from 1 to 50 V per 30 seconds.

A	l	a	r	m	s		S	e	t	u	p								
L	p		V		R	a	t	e		o	f		C	h	a	n	g	e	
		v					^			E	n	t			E	x	i	t	

Figure 5-21.

6. Set up a Chamber Temperature alarm by entering the +/- deviation from 45°C at which the alarm should activate.

A	l	a	r	m	s		S	e	t	u	p								
C	h	a	m	b	e	r		T	e	m	p	.		A	l	a	r	m	
		v					^			E	n	t			E	x	i	t	

Figure 5-22.

CRRM0000056

7. The Purge alarm will remain active for a default time of 15 minutes at startup or after the purge is restored.

A	l	a	r	m	s		S	e	t	u	p								
P	u	r	g	e		A	l	a	r	m		T	i	m	e	o	u	t	
		V				Λ			E	n	t			E	x	i	t		

Figure 5-23.

8. Set the Status Alarms Mode to Latching or Non Latching. This value allows the user the option to latch an alarm condition, or not, to allow for after-the-fact troubleshooting of intermittent problems or user acknowledgment of an alarm.

A	l	a	r	m	s		S	e	t	u	p								
S	t	a	t	u	s		A	l	a	r	m	s		M	o	d	e		
		V				Λ			E	n	t			E	x	i	t		

Figure 5-24.

Calibration

Overview

The analyzer requires a two-point linear calibration. During the calibration procedure the average of the raw detector signals corresponding to two known sulfur concentrations are latched by the unit and retained in non-volatile memory.

During normal operation, the average detector reading is interpolated on the line to derive the sulfur concentration reported.

CRRM0000057

The graph below illustrates a typical SOLA II Flare calibration.

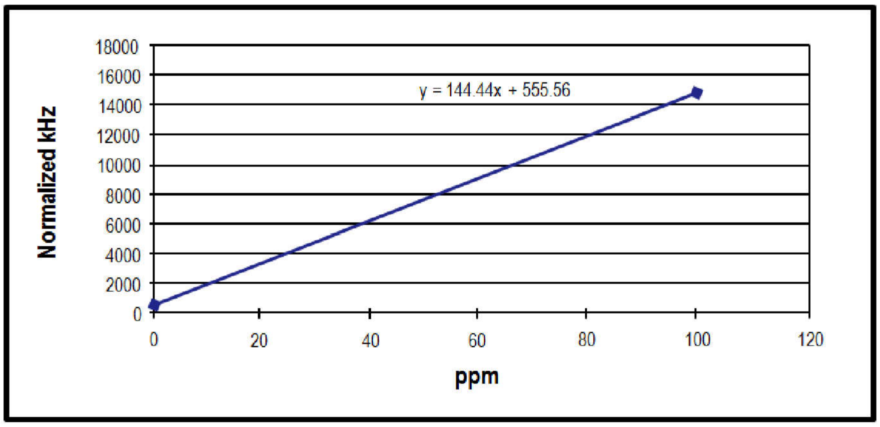

Figure 5-25. Typical SOLA II Flare calibration

Prior to calibrating the instrument, the sulfur concentration expected at the two points must be entered in the calibration setup menus (Configuration > Calibration Setup). In the software, these points are referred to as high and low calibration values.

For the graph above, the values would be:

Low cal value = 0.00 ppm	Low cal = 555.560 kHz
High cal value = 100.00 ppm	High cal = 15,000.000 kHz

The high calibration value needs to be as close as possible to the full range sulfur concentration expected in the process, and the low calibration value is normally set to zero so that only one standard is required for calibration.

The high and low calibration can be performed independently. Changing either one of the calibration points will change the slope of the line. This is illustrated in the next two graphs.

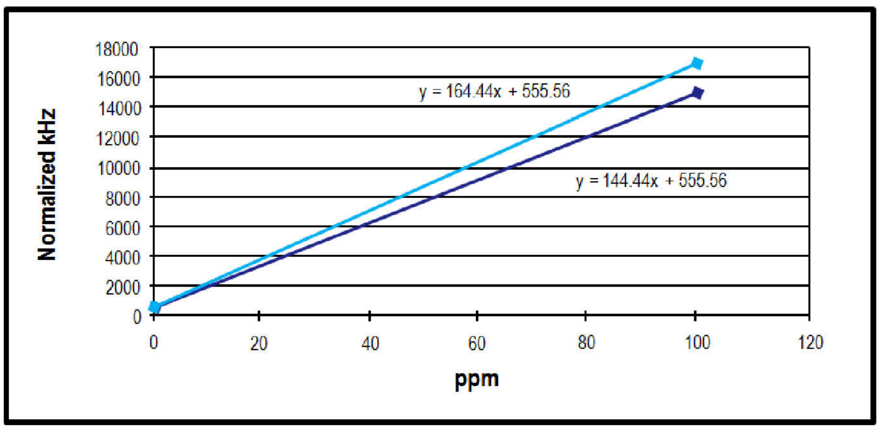

Figure 5-26. High calibration

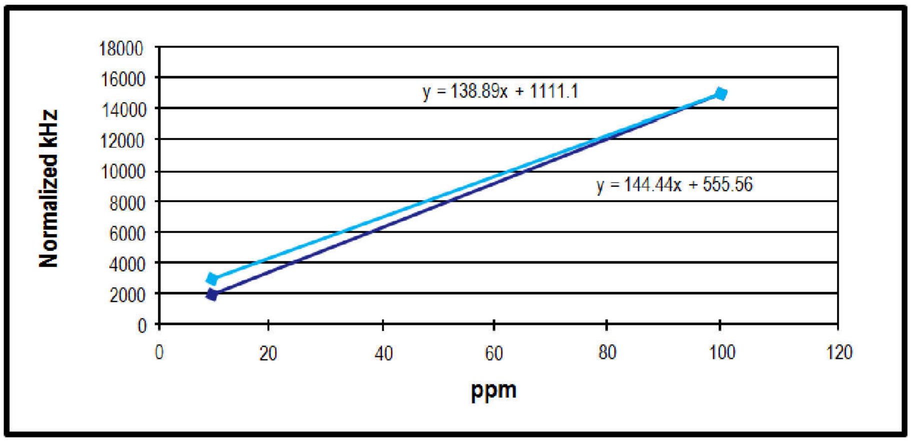

Figure 5-27. Low calibration

If necessary, the Adjust Reading function in the Calibration Setup menu can be used to correct the calibration by moving the line without changing the slope.

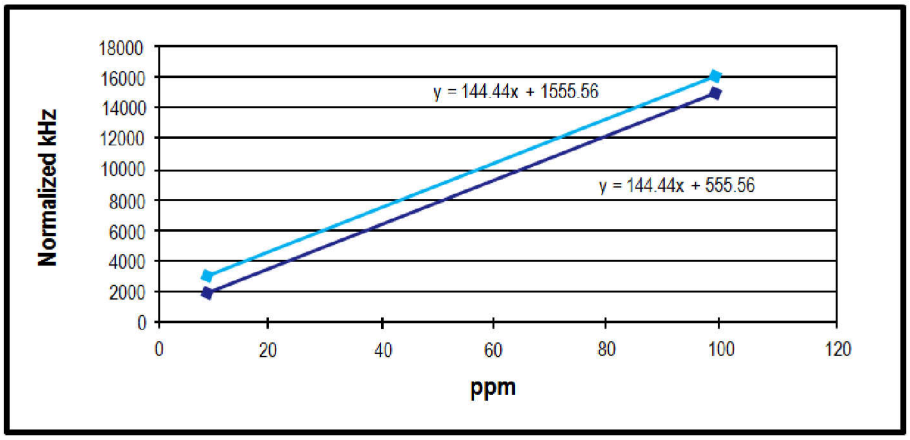

Figure 5-28. Corrected calibration

There are several calibration functions that can be performed. These are discussed in the following sections.

Calibration Setup

With this option, you will need to configure each calibration (Cal A and Cal B) independently. Both Cal A and Cal B have recalibrate functions, but the function only operates with the currently-running Cal selection. The Calibration Setup menu consists of parameters for Cal A and Cal B. Cal A items appear first.

Table 5-1. Calibration parameters

Cal A	Cal B
Cal A Inject Valve (V1 or V2)	Cal B Inject Valve
Cal A High Value	Cal B High Value
Cal A Low Value	Cal B Low Value
Recalibrate A High	Recalibrate B High
Recalibrate A Low	Recalibrate B Low
Adjust A Reading	Adjust B Reading
High Cal A KHz	High Cal B KHz
Low Cal A KHz	Low Cal B KHz

Manually Calibrating a Low Value

1. Manipulate gases via the SCS Valve Select menu to allow the Range A or Range B Low calibration standard to flow into instrument.
2. Watch the instrument's display and wait for the sulfur value to stabilize.
3. Access the Configuration Menu on the SOLA II Flare's display.
4. Access the Calibration Setup Menu.
5. Select Recalibrate Low.
6. Total sulfur content will appear on the display.
7. The phrase Recalibrate Low? will appear on the display.
8. Press the Yes button.
9. Manipulate the valve on the sample conditioning system to allow the sample to once again flow into the instrument.

Manually Calibrating a High Value

1. Manipulate gases via the SCS Valve Select menu to allow the Range A or Range B High calibration standard to flow into instrument.
2. Watch the instrument's LCD and wait for the sulfur value to stabilize.
3. Access the Configuration Menu on the SOLA II Flare's display.
4. Access the Calibration Setup Menu.
5. Select Recalibrate High.
6. Total sulfur content will appear on the display.
7. The phrase Recalibrate High? will appear on the display.

8. Press the Yes button.
9. Manipulate the valve on the sample conditioning system to allow the sample to once again flow into the instrument.

The Recalibrate High Function

Use this function if manually introducing the high calibration standard to the analyzer.

1. Go to Configuration > Calibration Setup > High Cal A Value. Set the high calibration value to match the concentration of the standard used. Exit the menu.
2. Connect the calibration standard to the unit, and let it flow through the injection valve.
3. Let the reported concentration reach a new value and stabilize.
4. Go to Configuration > Calibration Setup > Recalibrate A High. Press Yes to accept the new high calibration.

At this point, the current average of the detector signal is latched to correspond to the high calibration value concentration.

Adjusting the Reading

If the reported value of the SOLA II Flare does not match a known sample value or the standard flowing through the instrument, you can adjust the reading. To do so, go to Configuration > Calibration Setup > Adjust Reading. The current reading will be displayed in an editing screen so that you can modify the reading to match the desired reading.

Note Do not use this function if the difference between the expected reading and the analyzer's reported reading is significant. The Adjust Reading function should only be used for making minor corrections to the calibration. Using this function improperly can hide malfunctions in the unit that need to be corrected. ▲

Calibration Setup Menu Items

This section contains the menu items within the Calibration Setup menu in the order in which they appear. Specific instructions on the various calibration functions are discussed in the previous sections.

C	o	n	f	i	g	u	r	a	t	i	o	n							
C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
		∨					∧			E	n	t			E	x	i	t	

Figure 5-29. Main menu heading

1. Select the engineering unit related to the concentration entered for the calibration values: ppm, ppb, or mg/L.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
C	a	l		U	n	i	t	s											
		∨					∧			E	n	t			E	x	i	t	

Figure 5-30.

2. Enter which valve is performing the Cal A injection, V1 or V2.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
C	a	l		A		I	n	j	e	c	t		V	a	l	v	e		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-31.

3. Enter the concentration of the high calibration standard for Cal A. See Manually Calibrating a High Value for more.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
H	i	g	h		C	a	l		A		V	a	l	u	e				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-32.

4. Enter the concentration of the low calibration standard for Cal A. If using only one calibration standard and nitrogen to calibrate the background, enter zero. See Manually Calibrating a Low Value for more.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
L	o	w		C	a	l		A		V	a	l	u	e					
		∨					∧			E	n	t			E	x	i	t	

Figure 5-33.

5. Enter which valve is performing the Cal B injection, V1 or V2.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
C	a	l		B		I	n	j	e	c	t		V	a	l	v	e		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-34.

6. Enter the concentration of the high calibration standard for Cal B. See Manually Calibrating a High Value for more.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
H	i	g	h		C	a	l		B		V	a	l	u	e				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-35.

7. Enter the concentration of the low calibration standard for Cal B. This can be the same standard used for calibration of the High Cal A or can use nitrogen as a zero standard.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
L	o	w		C	a	l		B		V	a	l	u	e					
		∨					∧			E	n	t			E	x	i	t	

Figure 5-36.

8. This step will latch the detector response and associate it to the High Cal A value.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
R	e	c	a	l	i	b	r	a	t	e		A		H	i	g	h		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-37.

9. This step will associate the response of the detector to the Low Cal A value.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
R	e	c	a	l	i	b	r	a	t	e		A		L	o	w			
		∨					∧			E	n	t			E	x	i	t	

Figure 5-38.

10. This step moves the calibration line so the reading matches the user-desired reading for Cal A.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
A	d	j	u	s	t		A		R	e	a	d	i	n	g				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-39.

CRRM0000064

11. This step will latch the detector response and associate it to the High Cal B value.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
R	e	c	a	l	i	b	r	a	t	e		B		H	i	g	h		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-40.

12. This step will associate the response of the detector to the Low Cal B value.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
R	e	c	a	l	i	b	r	a	t	e		B		L	o	w			
		∨					∧			E	n	t			E	x	i	t	

Figure 5-41.

13. This step moves the calibration line so the reading matches the user desired reading for Cal B.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
A	d	j	u	s	t		B		R	e	a	d	i	n	g				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-42.

14. The steps shown in Figures 5-43 through 5-46 permit the user to view and/or modify the values latched during recalibration.

C	a	l	i	B	r	a	t	i	o	n		S	e	t	u	p			
H	i	g	h		C	a	l		A		K	H	z						
		∨					∧			E	n	t			E	x	i	t	

Figure 5-43

.

CRRM0000065

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
L	o	w		C	a	l		A		K	H	z							
		∨					∧			E	n	t			E	x	i	t	

Figure 5-44.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
H	i	g	h		C	a	l		B		K	H	z						
		∨					∧			E	n	t			E	x	i	t	

Figure 5-45.

C	a	l	i	b	r	a	t	i	o	n		S	e	t	u	p			
L	o	w		C	a	l		B		K	H	z							
		∨					∧			E	n	t			E	x	i	t	

Figure 5-46.

Validation Setup

Validation setup creates an automatic sequence to go through the stages that allow the user to select which pneumatic outputs and calibration are used. Table 2-1 shows the validation requirements.

Review the following for instructions pertaining to automatic validation setup.

1. Access the menu items by pressing Enter.

C	o	n	f	i	g	u	r	a	t	i	o	n							
V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-47.

2. Select Enabled or Disabled to activate/deactivate this feature.

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
D	a	i	l	y		V	a	l	i	d	a	t	i	o	n				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-48.

3. Enter the time of day (hh:mm:ss) that the SOLA II Flare is to begin the automatic validation process.

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
V	a	l	i	d	a	t	i	o	n		T	i	m	e					
		∨					∧			E	n	t			E	x	i	t	

Figure 5-49.

4. Select Disabled or one of 10 predefined control output states.
   0. Disabled
   1. Local Low Cal A
   2. Local Low Cal B
   3. Local Mid Cal A
   4. Local Mid Cal B
   5. Local High Cal B
   6. Probe Low Cal A
   7. Probe Low Cal B
   8. Probe Mid Cal A
   9. Probe Mid Cal B
   10. Probe High Cal B

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
S	t	e	p		1		S	e	l	e	c	t	i	o	n				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-50.

5. Enter the number of minutes (0-60) that the SOLA II Flare is to remain in this particular validation step.

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
S	t	e	p		1		T	i	m	e									
		∨					∧			E	n	t			E	x	i	t	

Figure 5-51.

6. Continue this selection process for up to six validation steps.

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
S	t	e	p		6		S	e	l	e	c	t	i	o	n				
		∨					∧			E	n	t			E	x	i	t	

Figure 5-52.

7. Enter the number of minutes (0-60) that the SOLA II Flare is to remain in this particular validation step.

V	a	l	i	d	a	t	i	o	n		S	e	t	u	p				
S	t	e	p		6		T	i	m	e									
		∨					∧			E	n	t			E	x	i	t	

Figure 5-53.

4–20 mA Range Setup

Each calibration is configured to use a unique range for the 4–20 mA output. The low end of the range (4 mA) always corresponds to zero sulfur concentration, and the upper end of the range (20 mA) is configurable for each calibration.

1. Enter the 20 mA value for the Calibration A Range.

4		t	o		2	0		m	A		R	a	n	g	e	s			
C	a	l	i	b	r	a	t	i	o	n		A		R	a	n	g	e	
		∨					∧			E	n	t			E	x	i	t	

Figure 5-54.

CRRM0000069

2. Enter the 20 mA value for the Calibration B Range.

4		t	o		2	0		m	A		R	a	n	g	e	s			
C	a	l	i	b	r	a	t	i	o	n		B		R	a	n	g	e	
		∨					∧			E	n	t			E	x	i	t	

Figure 5-55.

3. Enter a value at which the high range will timeout switch back to the low range.

4		t	o		2	0		m	A		R	a	n	g	e	s			
H	i	g	h		R	a	n	g	e		T	i	m	e	o	u	t		
		∨					∧			E	n	t			E	x	i	t	

Figure 5-56.

4. Enter the switch hysteresis value, a percentage of value change needed to switch ranges.

4		t	o		2	0		m	A		R	a	n	g	e	s			
S	w	i	t	c	h		H	y	s	t	e	r	e	s	i	s			
		∨					∧			E	n	t			E	x	i	t	

Figure 5-57.

Note During auto-ranging, the change of ranges is controlled by the calibration value plus or minus the hysteresis percentage value. ▲

Chapter 6: Viewing Alarms

The second top-level menu is the View/Ack Alarms menu. Access this menu to review all active alarms. The display will scroll through the alarms automatically.

S	L	I	I	-	F		4	.	4		1	1	/	1	8	/	1	3	
V	i	e	w	/	A	c	k		A	l	a	r	m	s					
		∨					∧			E	n	t			E	x	i	t	

Figure 6-1.

Press Ack on the system display to acknowledge the alarm.

V	i	e	w	/	A	c	k		A	l	a	r	m	s					
I	n	j	e	c	t		T	e	m	p	e	r	a	t	u	r	e		
		∨					∧			A	c	k			E	x	i	t	

Figure 6-2.

For a complete list of alarms, see Figure 3-3.

CRRM0000072

Chapter 7: Diagnostics

There are four submenus within the Diagnostics top-level menu: Input & Output Test, View Parameters, Com Ports RX TX and Pulse UV Control.

S	L	I	I	-	F		4	.	4		1	1	/	1	8	/	1	3	
D	i	a	g	n	o	s	t	i	c	s									
		∨				∧				E	n	t			E	x	i	t	

Figure 7-1.

Input & Output Test

The Input & Output Test menu consists of four groups of submenus: Set Outputs Menu, View Mux Analogs, 4–20 mA Inputs, and View Digital Inputs.

D	i	a	g	n	o	s	t	i	c	s									
I	n	p	u	t		&		O	u	t	p	u	t		T	e	s	t	
		∨				∧				E	n	t			E	x	i	t	

Figure 7-2.

Set Outputs

In the Set Outputs group, press Tgle on the system display to toggle the associated relay on and off.

I	n	p	u	t		&		O	u	t	p	u	t		T	e	s	t	
S	e	t		O	u	t	p	u	t	s									
		∨				∧				E	n	t			E	x	i	t	

Figure 7-3.

CRRM0000074

Following are the relays that can be accessed through the Set Outputs group.

Table 7-1.

Output	Function
RLY 1 Spare	Spare relay
RLY 2 Spare	Spare relay
RLY 3 Spare	Spare relay
RLY 4 Spare	Spare relay
RLY 5 Spare	Spare relay
RLY 6 Spare	Spare relay
RLY 7 Spare	Spare relay
RLY 8 Spare	Spare relay
Inj V1 Solenoid	Controls 10-port injection valve
Inj V2 Solenoid	Controls 6-port injection valve
Rng V3 Solenoid	Range selection valve
V4/ Solenoid 1 Solenoid	Cal sample select
Solenoid 5	Generic output for sample control
Solenoid 6	Generic output for sample control
Solenoid 7	Generic output for sample control
Solenoid 8	Generic output for sample control
Chn 1 4-20	Press Enter to change the 4–20 mA output for Cal A to 4, 8, 12, 16, or 20 mA.
Chn 2 4-20	Press Enter to change the 4–20 mA output for Cal B to 4, 8, 12, 16, or 20 mA.
PMT Supply	Shows only the active supply voltage
CNTRL 00 LED	Control output for LED indicator
CNTRL 01 UV Lamp	Control output for UV lamp
Bench CNTRL ##	Reserved for factory test only; the 2 pound signs (##) indicate the control output.
CNTRL 7 S&H	Sample & Hold control
CNTRL # Gain	Gain Control

View MUX Analogs

You can view the MUX analogs by accessing this menu. Note that all signals are displayed as raw frequencies.

D	i	a	g	n	o	s	t	i	c	s									
V	i	e	w		M	u	x		A	n	a	l	o	g	s				
		∨					∧			E	n	t			E	x	i	t	

Figure 7-4.

Following are the analogs in the order they appear within menu:

1. ADC 0 Lamp V
2. ADC 1 Chamber Flow
3. ADC 7 Pressure
4. ADC 9 PMT V
5. ADC 10 Chamber T
6. ADC 11 Ambient T

View 4–20 mA Inputs

Access this submenu to view the optional 4–20 mA inputs.

I	n	p	u	t		&		O	u	t	p	u	t		T	e	s	t	
4	-	2	0		m	A		I	n	p	u	t							
		∨					∧			E	n	t			E	x	i	t	

Figure 7-5.

CRRM0000076

View Digital Inputs

When you access the View Digital Inputs menu, the status of the inputs is reported but the functions are ignored.

I	n	p	u	t		&		O	u	t	p	u	t		T	e	s	t	
V	i	e	w		D	i	g	i	t	a	l		I	n	p	u	t	s	
		∨					∧			E	n	t			E	x	i	t	

Figure 7-6.

Following is a list of inputs and their functions.

Table 7-2.

Input	Function
Purge Fail	Displays the status of the purge sense pressure switch.
Flow Switch	Displays the status of the flow monitoring switch.
Watlow Alarm	Displays the status of the Watlow alarm input
I/O Board	Displays the status of all eight inputs simultaneously. Zero (0) denotes open. One (1) denotes closed.
CPU Digital In	
Dip Switches	Displays the positions of dip switches located in the motherboard (dip switches are used to indicate options installed)
I/O Board Option	
4–20 mA Input Option	Not used in SOLA II Flare
Com 4 Modem	Modbus input
Remote Suspend	Displays the status of the remote suspend switch

View Parameters

Each menu item within the View Parameters menu displays the parameter name, current value, minimum value, and maximum value. Displaying the minimum, maximum, and current values for a period of time enables you to monitor signal stability.

Note When you select a parameter to view, the minimum and maximum values are briefly reset to the current value. ▲

CRRM0000077

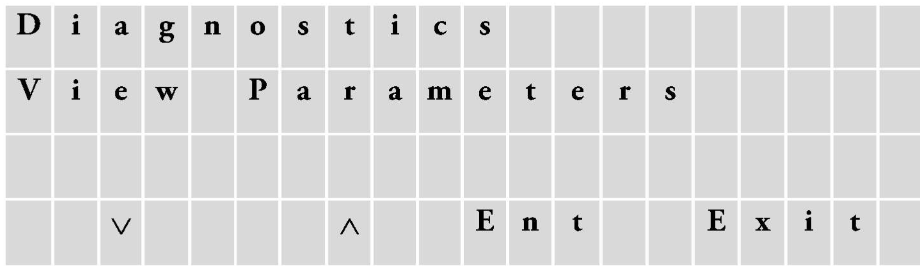

Figure 7-7.

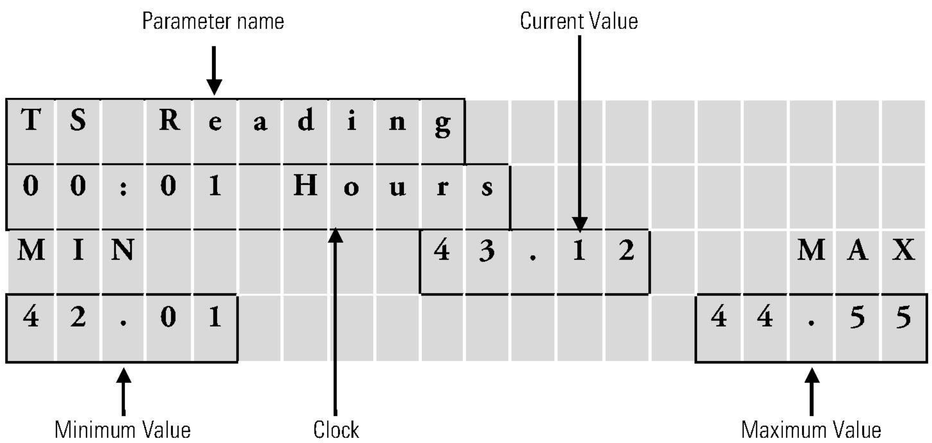

Figure 7-8.

Following are the menu items within the View Parameters menu.

Table 7-3.

Menu Item	Description
TS Reading	The concentration reading.
Cal A Response Factors	The slope (kHz/ppm or kHz/ppb sensitivity) and the offset (calculated at 0 concentration).
Cal B Response Factors	The slope (kHz/ppm or kHz/ppb sensitivity) and the offset (calculated at 0 concentration).
Working Average Sec	When switching from the normal average to the fast average and back to normal, the average time used can be observed from this menu item.
AVG PMT signal kHz	The average of the raw detector signal.
Normalized PMT kHz	The frequency proportional to the PMT output normalized to the gain of 100; also displays the gain currently selected.
PMT Signal kHz	The actual frequency proportional to the PMT output; also displays the gain currently selected.
PMT Voltage	The input voltage to the PMT.
Internal Temperature	The temperature inside the electronics enclosure.
Chamber Temperature	The temperature inside the reaction chamber.
Chamber Flow	The flow through the reaction chamber.
Chamber Pressure	The pressure sensed at the reaction chamber.
Lamp I Alm Counter	The frequency proportional to the lamp intensity.
Lamp Voltage	The lamp input voltage.

Com Ports RX TX

This menu displays activity for Coms 1–4.

D	i	a	g	n	o	s	t	i	c	s									
C	o	m		P	o	r	t	s		R	x		T	x					
		∨					^			E	n	t			E	x	i	t	

Figure 7-9.

CRRM0000079

The available Coms selections are:

- Com 1 (I/O Boards)
- Com 2 (Maintenance)
- Com 3 Modbus
- Com 4 Modbus

C	o	m		P	o	r	t	s		R	x		T	x					
C	o	m	1		(	I	/	O		B	o	a	r	d	s	)			
		∨					∧			E	n	t			E	x	i	t	

Figure 7-10.

Pulse UV Control

Following are the menu items within the Pulse UV Control menu.

Caution This menu is intended for factory test only. Incorrect settings can result in damage to the unit. ▲

Table 7-4.

Menu Item	Description
Flash Lamp On/Off	Turn the UV lamp flashing on or off.
Auto Gain On/Off	Turn the amplifier auto gain selection on or off. **Note** Auto gain defaults to ON during normal operation. ▲
PMT Signal Gain	Select the amplifier gain (1, 2, 5, 10, 20, 50, 100). **Note** The selection is only valid when auto gain is turned OFF. ▲
Test Gains	Place the gain selection under manual control to verify the functionality of the programmable gain amplifier.
Test LED On/Off	Test the LED by turning it on and off.
Flash Frequency	Change the UV lamp flash frequency (normally 10 Hz).
Flash Time	Change the duration of the flashing pulse (normally 100 µs).
S&H Time	Change the duration of the sample portion of the sample and hold analog front end (normally 100 µs). (Sample portion is the amount of time the sample and hold device is in the SAMPLE state.)

Chapter 8: Maintenance & Troubleshooting

Safety Precautions

Caution Some internal components can be damaged by small amounts of static electricity. Take appropriate precautions (use a properly grounded antistatic wrist strap) when handling electronic boards and components.

To avoid damaging internal components, follow these precautions when performing any service procedure:

Wear an antistatic wrist strap that is properly connected to earth ground. If an antistatic wrist strap is not available, be sure to touch a grounded metal object before touching any internal components.

Handle all printed circuit boards by the edges.

Carefully observe the instructions in each procedure. ▲

Maintenance Schedule

Table 8-1. Maintenance schedule

Frequency	Tasks
Monthly	Calibrate the analyzer (see Calibration).
Every three months	Replace the injection valve rotors according to Appendix B.
Every six months	Visually inspect and clean the instrument. Check the instrument flow rates as explained later in this chapter. Replace the valve body according to Appendix B.
Annually	Test the instrument for internal leaks as explained later in this chapter.
Every 18 months	Replace the pyrolyzer heater as explained later in this chapter.

Visual Inspection & Cleaning

The analyzer should be inspected occasionally for obvious visible defects, such as loose connectors, loose fittings, cracked or clogged Teflon lines, and excessive dust or dirt accumulation. Dust and dirt can accumulate in the instrument and can cause overheating or component failure. Dirt on the components prevents efficient heat dissipation and may provide conducting paths for electricity.

Warning Remove all instrument power before cleaning electronics. ▲

The best way to clean the inside of the instrument is to first carefully vacuum all accessible areas and then blow away the remaining dust with low-pressure compressed air. Use a soft paintbrush or cloth to remove stubborn dirt.

Leak Tests

A leak test should be completed when starting up a new unit or replacing components such as valves, rotors, regulators, gauges, etc., in the flow paths of the clean air flow, nitrogen flow and sample flow. These three flow paths are critical and must not leak. The clean air and nitrogen used should be zero-grade and sulfur-free, as they are used in the sulfur analysis flow paths. Instrument air is used for the oven air, electronics purge and valve actuation. Small leaks in the instrument air flow are not critical, but check to ensure fittings are tight.

Caution Purge all sample lines with nitrogen until the total sulfur reading stabilizes near zero ppm on the low range. Once the reading stabilizes, wait at least 15 minutes to ensure all sulfur is purged from the system. Disconnect the communication lines to prevent remote actuation of gas selection valves. Only clean air and nitrogen are needed for the leak check. ▲

Once the system has been purged with nitrogen, lower the oven air pressure below 4 psig to allow the oven and pyrolyzer to cool. After the oven cools, turn the oven air pressure regulator off. All regulators for clean air, nitrogen and sample should be set to zero psig. Leave the power on, as it will be needed during the leak test to actuate valves.

Clean Air Leak Test

1. Clean air 1, 2 and 3 flow paths are common to each other (teed together) downstream of the injection valves and before the mixing chamber, as shown in the flow diagram, Figure 1-2. Check all fittings in the clean air flow path for tightness.
2. Ensure the three clean air regulators are set to zero psig.
3. Cap the tube exiting the pyrolyzer into the pneumatics at the 1/8-inch union. Remove the 1/8-inch Teflon tube and cap the union. This 1/8-inch Teflon tube goes into the inlet of the PUVF detector. Without applying pressure to the PUVF detector, check the fittings for tightness.
4. After capping the union, turn the pressure on the clean air 1 regulator to 15 psig. As all three clean air flow paths are common downstream, all three air gauges will slowly pressure up to 15 psig. This will take several minutes, as there are restrictors in the flow paths.
5. Once all three clean air gauges read 15 psig, back off the clean air 1 regulator. The pressure may fall a few psig at first, but should then hold steady on all three gauges since these are non-relieving regulators and the downstream tube has been capped.

6. Monitor these pressure gauges for 15 minutes to make sure the pressure does not decrease. If the pressure does decrease, pressure everything back up to 15 psig and use a liquid leak detector to find the leak. Repeat the above steps once the leak has been resolved.
7. Ensure the quartz tube in the pyrolyzer is not cracked or leaking at the graphite ferrules. The pyrolyzer is a sealed assembly, meaning the quartz tube could be cracked and leaking without being obvious because the entire pyrolyzer case could pressure up.
8. Once the clean air gauges are all stable at around 15 psig, and the clean air regulators are all backed off with pressure holding steady, remove the ¼-inch cap at the bottom of the pyrolyzer to vent the pyrolyzer case.
    a. If the pressure holds, replace the cap and the clean air leak test is complete.
    b. If the pressure falls, then either the quartz tube is cracked and must be replaced or the fittings holding the tube at the top of the pyrolyzer need to be tightened. Care must be taken when tightening these fittings to avoid breaking the quartz tube.

Note When replacing a quartz tube and graphite ferrules, it is advisable to loosen the fitting while tightening and forming the soft graphite ferrule to keep from twisting and breaking the quartz tube. The graphite will grip the quartz tube and twist it; loosening will allow the ferrule to slip back while forming around the quartz tube. ▲

        i. Once the quartz tube is replaced, repeat the leak test and make sure all pressures hold.

9. Flows should be checked at the 3-way valves for the three clean air flows. These flows should be close to those recorded on the instrument data sheet from the factory. Add the three flows together and compare them with the flow at the PUVF vent. The flows should be within 5 to 10cc. If there is a difference of more than 10cc, check the PUVF detector and associated tubing for leaks by tightening all fittings.

Sample Flow Leak Test

Caution Purge all sample lines with nitrogen until the total sulfur reading stabilizes near zero ppm on the low range. Once the reading stabilizes, wait at least 15 minutes to ensure all sulfur is purged from the system. Disconnect the communication lines to prevent remote actuation of gas selection valves. Only clean air and nitrogen are needed for the leak check. ▲

Refer to the SOLA II Flare flow diagram (Figure 1-2) for the following leak test:

Note All tubing connections in the sample flow path should be checked for tightness. ▲

Note This leak test is fairly complex and should be done in two stages. There are two sample/nitrogen flow paths. Depending on the range selected, the sample will flow through one injection valve while nitrogen is purging the other injection valve. ▲

1. To begin, connect an external source of nitrogen to the sample inlet of the SOLA II Flare. Set the pressure to 30 psig.
2. Set the clean nitrogen regulator, located in the pneumatic section of the SOLA II Flare, to zero psig. Set the 1/8-inch, four-port range select valve to the Off position using the input/output test under the diagnostic menu of the SOLA II Flare. Go to Diagnostics > Input Output Test > Set Outputs > Rng V3 Solenoid and turn the valve off. This will push the external nitrogen source through the six-port injection valve.
3. Disconnect any tubing and cap the outlet of the internal back pressure regulator in the oven.
4. Set the internal forward pressure regulator in the oven to 30 psig.
5. Fully open the internal back pressure regulator (counter clockwise). This will allow 30 psig of pressure all the way to the capped outlet port of the back pressure regulator.
6. Referring to the flow diagram, inspect all connections in the sample flow path with liquid leak detector. Additionally, inspect the valve slots where the valve actuation pins are located as well as the valve preload assemblies with liquid leak detector. If these show external valve leaks, replace or align the valves. See the valve alignment procedure for further information.

7. Each sample flow path flows through a dedicated check valve. Once the flow exits the check valve outlet, the flow paths tee together and pass into the inlet of the back pressure regulator. If one of the check valves is leaking or malfunctioning, this could simulate a leak. In the first stage of the leak test, the flow moves through the six-port valve to the check valve on that flow path. Cap the inlet of the check valve on the 10-port valve's flow path to ensure the check valve is functioning properly.
8. Turn the external source of nitrogen off, but leave it connected so pressure remains on the system. Pressure should be at 30 psig on the forward and back pressure regulator gauges. Monitor this for at least 15 minutes to make sure this pressure holds steady and does not bleed down. If the pressure holds, remove the cap from the check valve and make sure the pressure continues to hold.
9. If the pressure bleeds down once the cap has been removed, the check valve must be disassembled and cleaned or replaced and then rechecked for a leak.
10. Once pressure without the cap remains continuous, replace the tubing.
11. Turn V3 On in the Diagnostics menu (refer to step 2). This will push the external nitrogen source through the 10-port valve. Turn the external source of nitrogen back on and repeat steps 6-9 above, including capping the inlet of the check valve from the sample outlet of the 6-port valve. If all pressures hold, remove the external source of nitrogen from the forward pressure regulator.
12. Continue on to test the clean nitrogen inlet.

Clean Nitrogen Leak Test

The last critical flow path is that of the clean nitrogen. The clean nitrogen regulator, located in the pneumatic section of the SOLA II Flare, should be set at 30 psig. Additionally, an external source of nitrogen should be connected to the clean nitrogen bulkhead on the left side of the unit. The external source should also be set at 30 psig. This flow path is through V3, the range select valve. All tubing leaving V3 should already be leak tested from the sample flow leak test. The only port on the V3 valve that has not been checked is the clean nitrogen inlet.

1. Ensure the outlet of the back pressure regulator outlet is still capped.
2. Make sure the clean nitrogen is set at 30 psig and verify that pressure is at 30 psig on the back pressure regulator gauge.

3. Turn the external source of nitrogen off, but leave it connected so pressure remains on the system.
4. Check all clean nitrogen connections from the entrance bulkhead up to V3 with liquid leak detector.
5. Monitor the pressure for 15 minutes to make sure it holds steady.
6. When complete remove the cap on the outlet of the back pressure regulator and reconnect any previously disconnected tubing.

Flow Rate Checks

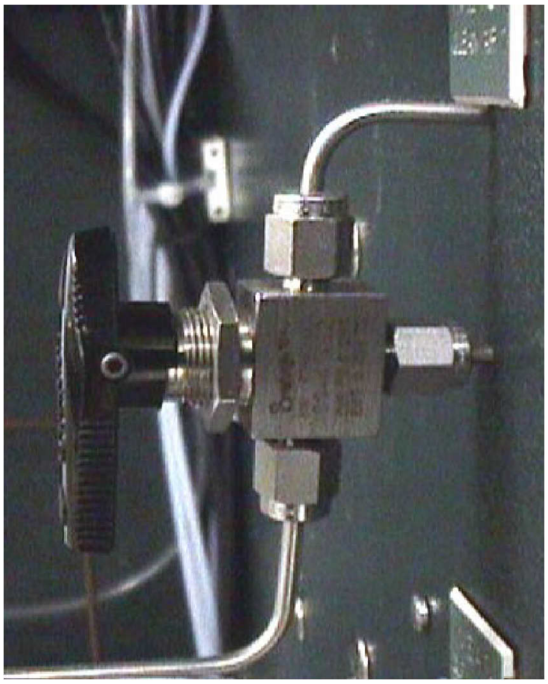

Figure 8-1. Three-way valve for measuring flow rates

1. Obtain a precision flow measurement instrument such as a bubble meter.
2. Ensure that all pressure regulators are set to the correct pressures as shown on the calibration data shipped with the instrument or as recorded in the instrument logbook.
3. Ensure that the analyzer is stabilized at normal operating temperatures before proceeding.
4. Suspend the analyzer according to Chapter 4.
5. Turn the Meas. Clean Air 1 three-way valves to point down for flow measurement.

6. Connect the flow meter to the Meas. Clean Air 1 port and adjust the Clean Air 1 regulator to obtain the required flow.
7. Turn the Meas. Clean Air 1 three-way valves to point up for normal operation.
8. Turn the Meas. Clean Air 2 three-way valves to point down for flow measurement.
9. Connect the flow meter to the Meas. Clean Air 2 port and adjust the Clean Air 2 regulator to obtain the required flow.
10. Turn the Meas. Clean Air 2 three-way valves to point up for normal operation.
11. Turn the Meas. Clean Air 3 three-way valves to point down for flow measurement.
12. Connect the flow meter to the Meas. Clean Air 3 port and adjust the Clean Air 3 regulator to obtain the required flow.
13. Turn the Meas. Clean Air 3 three-way valves to point up for normal operation.
14. Restart the analyzer according to Chapter 4.

The Rotary Valve

For detailed instructions on maintaining, removing, and replacing the rotary valve, refer to Appendix B.

The Mixing Chamber

To remove the mixing chamber, follow the steps below.

1. Shut down the system according to Chapter 3.
2. Loosen the fittings that connect the tubing to the mixing chamber.
3. Loosen the screw in the center of the bracket holding the mixing chamber to the bottom of the enclosure.
4. Carefully slide the mixing chamber from the bracket.

To reinstall the mixing chamber, follow the steps below.

1. Carefully slide the mixing chamber into the bracket.
2. Tighten the screw in the center of the bracket to hold the mixing chamber to the bottom of the enclosure.

3. Tighten the fittings that connect the tubing to the mixing chamber.
4. Restart the system.

Replacing the Pyrolyzer Heater

Warning The pyrolyzer can be extremely hot, even after power is turned off. Use extreme care to prevent burns. ▲

The pyrolyzer heater is enclosed in the pyrolyzer housing, which is shown in the figure below.

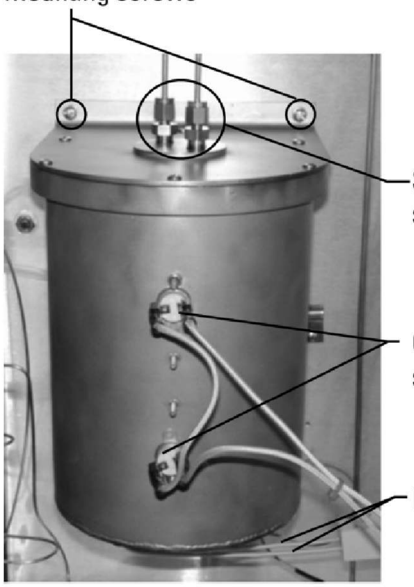

Figure 8-2. Pyrolyzer housing

The following table lists the part numbers for the parts referenced in this procedure. With the exception of the heater being replaced, the existing parts can be reused if in good condition. The part numbers are provided here for convenience.

Table 8-2. Parts list for heater replacement

P/N	Qty	Description
27-1108-0	1	Thermocouple, S-type
29-1230-0	1	Heater, fiber insulated, 60 V/450 W
29-1231-0	1	Insulation, flameless burner
30-1025-0	1	Pyrolyzer tube, looped
40-0025	0.5 ft^2	Kaowool® insulation
56-1074-0	1	Terminal, 2 pole ceramic block, 30 A
64-1301-0	2	Heater wire sleeve, flameless burner
65-1041-0	1 ft	Insulation, fiberglass
68-1269-2	2	Red SS, 1Tx4T
89-2917-0	1	Pyrolyzer, tested assembly (includes housing, housing lid, O-ring, screws, washers)
HA-101812	2	Ferrule, 1/4 graphite

1. Follow the Maintenance Shutdown Procedure to shut down the analyzer system. Allow the system to cool completely.
2. Carefully remove the two sample tubes from the top of the pyrolyzer housing using a backup wrench to keep the stainless steel fittings from turning.
3. Loosen the terminal block screws and disconnect the thermocouple wires. Be sure to note the orientation of the wire colors.
4. If installed, disconnect the wires from the oven temperature switches; the wire between the two sensors can be left in place.
5. Slightly loosen the two screws that attach the bottom of the housing to the back of the oven.
6. Support the housing while removing the top two mounting screws that hold it to the back of the oven. After both screws have been removed, lift the pyrolyzer up and out of the oven. Do not discard the mounting screws. You will need them later.

7. Remove the six screws and washers from the lid of the housing. Set them aside for later use.

Figure 8-3. Remove the pyrolyzer housing lid

8. Gently lift the lid off and set it aside.

Note The pyrolyzer tube, insulation, and Kaowool™ insulation will be attached to the lid. Carefully lift all of it out to avoid damaging the pyrolyzer tube. ▲

Figure 8-4. Housing lid with insulation and pyrolyzer tube attached

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9. As shown in the following figure, the heater wires are attached to the terminal block. Remove the heater wires from the terminal block and straighten the wires. Remove the fiberglass insulation that covers the heater wires. Set the insulation aside. You will need it later.

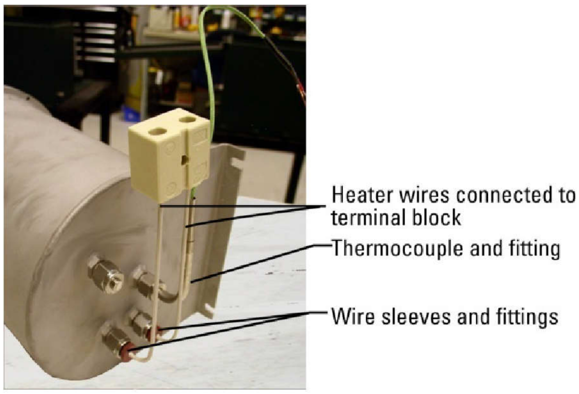

Figure 8-5. Heater wires and thermocouple

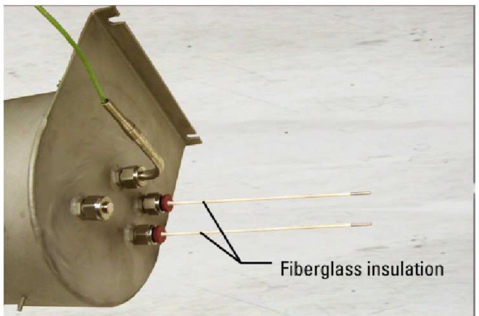

Figure 8-6. Remove the fiberglass insulation

10. Loosen the fittings around the heater wires and remove the wire sleeves. Set the sleeves and fittings aside.
11. Loosen the thermocouple fitting and remove the thermocouple from the housing. Set it aside for re-installation later.
12. You should now be able to remove the heater from the housing.

13. Insert the replacement heater into the housing.

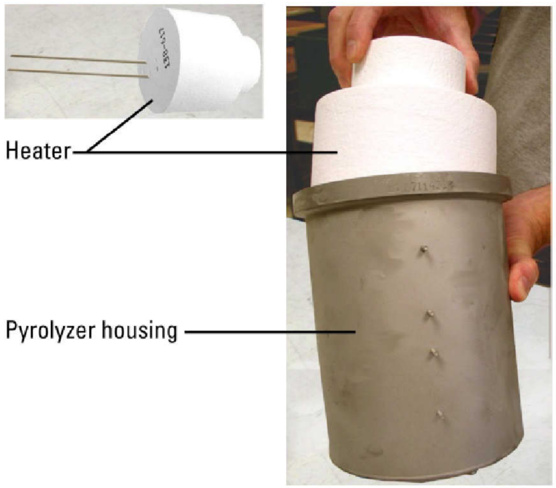

Figure 8-7. Insert replacement heater into housing

14. Feed the two heater wires through the two fittings on the other side of the housing.

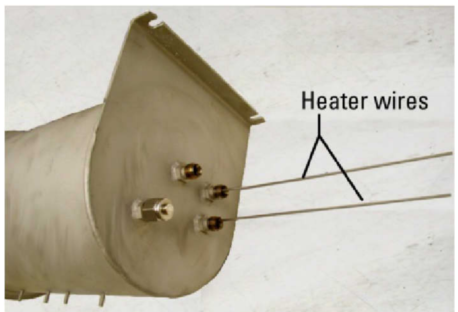

Figure 8-8. Heater wires fed through fittings

15. Slide the wire sleeves onto the heater wires. Tighten the stainless steel fittings.

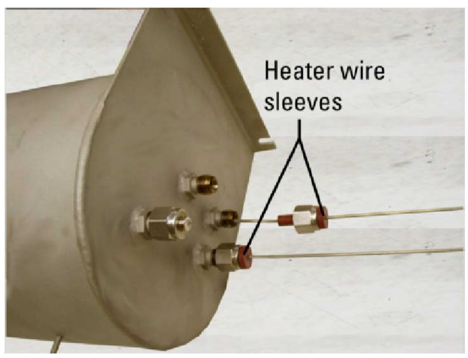

Figure 8-9. Wire sleeves and fittings

16. You will need to make a hole in the heater insulation to accommodate the thermocouple. Insert a drill bit through the fitting in the housing for the thermocouple and press it through the heater insulation to make the hole. Remove the bit, and then carefully feed the thermocouple tube through the stainless steel fitting on the housing. Tighten the thermocouple fitting to secure it to the housing.

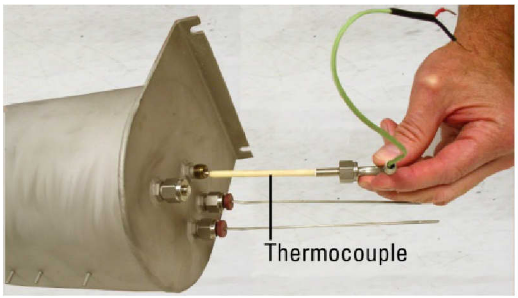

Figure 8-10. Insert the thermocouple

17. Slide the two pieces of fiberglass insulation that you removed earlier over the heater wires, leaving 3/8” exposed.

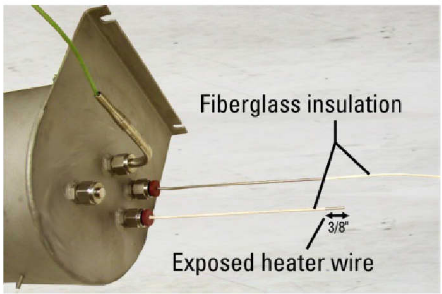

Figure 8-11. Add the fiberglass insulation

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18. Insert the ends of the heater wires into the terminal block and tighten them. Bend the wires as shown in the figure below.

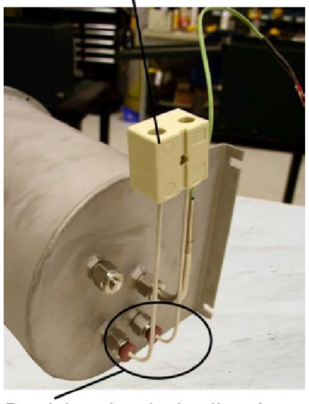

Figure 8-12. Heater wires inserted into terminal block

19. Inspect the O-ring around the open end of the pyrolyzer housing. If necessary, replace it and apply a lubricant compound, such as Dow Corning® 111, around it.

Figure 8-13. Pyrolyzer housing O-ring

20. Gently slide the lid into the housing.

Note The pyrolyzer tube, insulation, and Kaowool insulation should still be attached to the lid. Slide the lid back in carefully to avoid damaging the pyrolyzer tube. ▲

21. Use the six screws and washers removed earlier to secure the lid to the housing.

22. With an air gun placed at the end of one fitting, blow out any dust or debris that may have dropped inside the pyrolyzer quartz or glass tube.

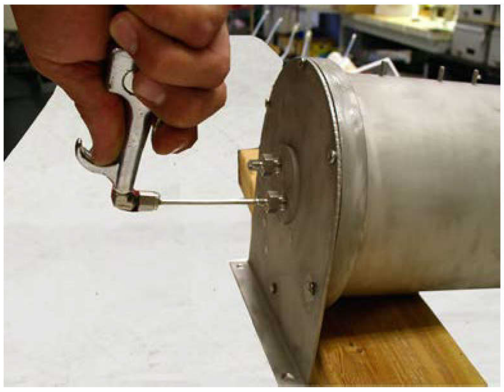

Figure 8-14. Blow out the debris

23. Secure the pyrolyzer housing to the oven enclosure using the screws removed earlier (two mounting screws on top of housing, two on bottom).
24. If necessary, reconnect the wires from the oven temperature switches.
25. Reconnect the heater wires to the pyrolyzer.
26. Reconnect the thermocouple wires.
27. Reconnect the sample tubing.
28. Follow the Initial Startup procedure to restart the analyzer.

The Pyrolyzer Reaction Tube

Replacement

To replace the pyrolyzer tube (p/n 30-1025-0), first complete steps 1 through 7 in the previous section, Replacing the Pyrolyzer Heater.

1. Gently lift the lid off the housing.

Note The pyrolyzer tube, insulation, and Kaowool insulation will be attached to the lid. Carefully lift all of it out of the housing. ▲

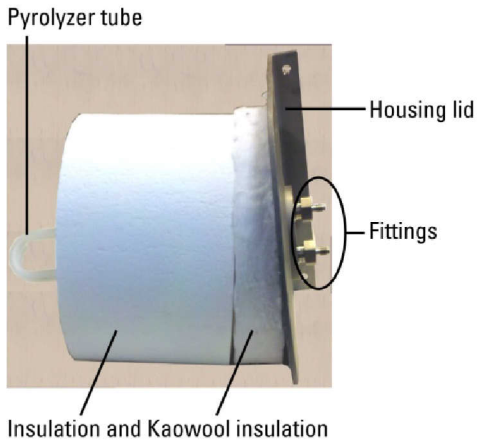

Figure 8-15. Housing lid with insulation and pyrolyzer tube attached

2. To remove the existing pyrolyzer tube, unscrew the two fittings from the lid while holding the tube in place. Remove the pyrolyzer tube and set it in a safe location. Set the fittings, insulation, and Kaowool insulation aside for use in the next steps.
3. Carefully push both ends of the replacement pyrolyzer tube through holes of the insulation.

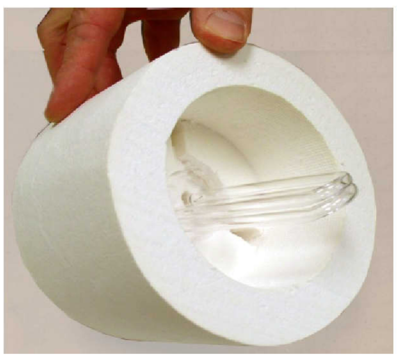

Figure 8-16. Pyrolyzer tube inserted into the insulation

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4. Holding the pyrolyzer tube in place, apply the Kaowool insulation over the top of the insulation.

Figure 8-17. Apply the Kaowool insulation

5. Holding the insulation and pyrolyzer tube, gently attach the housing lid against the insulation, allowing both ends of the tube to come out of the lid approximately 1/2”. Attach one of the graphite ferrules and one of the fittings removed earlier to each of the pyrolyzer tube ends.

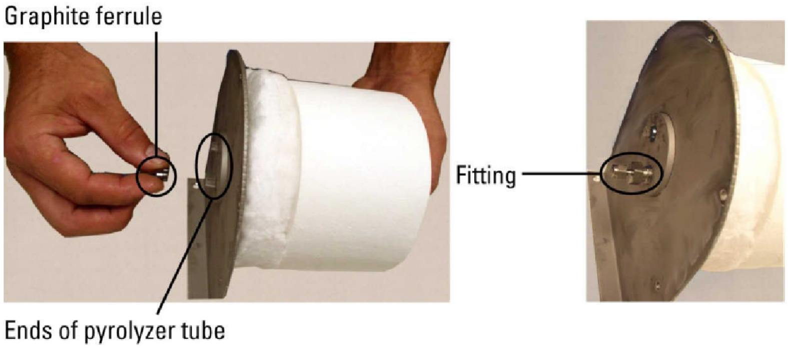


Figure 8-18. Reattach the ferrules and fittings

6. Gently slide the lid back into the housing and secure it using the screws and washers removed earlier.

7. With an air gun placed at the end of one fitting, blow out any dust or debris that may have dropped inside the pyrolyzer quartz or glass tube (Figure 8-14).

8. Follow steps 22 through 27 in the previous section, Replacing the Pyrolyzer Heater, to re-install the housing and complete this procedure.

CRRM0000098

Decoking

Coking (carbon buildup) can occur in the pyrolyzer reaction tube when sample or calibration flow is too high or when there is no airflow. It is evidenced by a light brown or black coating on the inside of the reaction tube. Carbon buildup in the reaction tube absorbs SO_2, resulting in poor instrument performance and invalid results.

Note Thermo Scientific does not recommend decoking the tube. Instead, replace the tube according to the previous section. ▲

General Troubleshooting

The analyzer has been designed to achieve a high level of reliability. Only premium components are used to ensure that complete failure is rare. In the event of problems or failure, the troubleshooting guidelines presented in the following table should be helpful in isolating the fault.

Table 8-3. Troubleshooting

Malfunction	Possible Cause	Action
Analyzer does not start up	No power	Ensure instrument is connected to the proper source
	Digital electronics	Ensure boards are seated properly and interconnecting cables are in place.
		Replace boards one at a time to isolate faulty board.
No response to sample	Instrument problems	Check for alarm messages and correct as necessary.
	Bad calibration	Ensure proper calibration.
	Flasher power supply	Replace with known good board.
	Lamp trigger pack	Replace with known good board.
	Lamp **Warning** Do not look directly into lamp without proper eyewear. ▲	Remove lamp and socket from flash holder by loosening the single set screw. Lamp flash should be clearly visible at 20 yards distance in well-lit room.
	PMT high voltage power supply	Check voltage on high voltage power supply connector: Should be close to the setting.
	PMT	Replace with known good board.
	Digital electronics	Replace board one at a time to isolate faulty board.
	Low or no sample flow	Check trend of chamber flow at workstation. If chamber flow is low or trending down, check for stoppage at the injection valve.

Malfunction	Possible Cause	Action
Sample Flow alarm displayed[1]	Sample supply inadequate or valves are closed or misaligned	Check process conditions and availability of sample supply. Ensure all valves are properly aligned.
	Filtration system obstructed	Clean or replace filters.
	Fast loop bypass flow set too high	Adjust bypass flow rate.
Chamber Flow alarm displayed[1]	Blocked line from mixing chamber to valve	Check lines.
	Inadequate supply of combustion air	
Lamp Voltage alarm displayed[1]	UV lamp is old/deteriorated	Replace UV lamp.
	Bench contaminated with incompletely combusted materials.	Purge system with carrier air (no sample) until output signal stabilizes. May take several days in severe cases.
Chamber Temperature alarm displayed[1]	Detector temperature not stabilized after service or enclosure opened	Close doors and allow system to stabilize.
	Ambient temperature or purge air is outside ambient temperature limits	Measure ambient and purge air temperatures and correct as necessary.
	Thermistor not positioned correctly	Reposition Thermistor.
Inject Temperature alarm displayed[1]	Instrument is starting up and not reaching control temperature for the pyrolyzer and oven	Normal alarm during start-up until pyrolyzer and oven temperatures stabilize.
	Pyrolyzer heater failure	Check pyrolyzer temperature. If much lower than normal and not increasing, check for voltage across the heater terminals. If voltage is present, shut down the instrument, disconnect the pyrolyzer heater contacts and measure heater continuity. Replace heater if it shows open.
	Pyrolyzer or oven temperature failure	Check electronics and replace if necessary.
Valve Fault alarm displayed[1]	Injection valve worn or scratched, causing port-to-port leakage	Replace valve rotor. In extreme cases, replace entire valve head. Check filtration system to ensure particulate is not getting to the injection valve.
	Defective flasher lamp, trigger pack, or lamp intensity control electronics	Check lamp, trigger pack, and electronics. Replace if necessary.

CRRM0000100

Malfunction	Possible Cause	Action
Purge Fail alarm displayed[1]	Loss of instrument air pressure	Check instrument air source pressure.
	Improper settings	Ensure oven air and purge pressures are set properly.
	Leakage at oven or electronic enclosure doors	Ensure oven and electronics enclosure doors are closed tightly and that door seals are in good condition.
	Leakage throughout electrical conduit	Ensure electrical conduit seals are poured.
Excessive signal noise	Internal sample or carrier leakage	Check instrument for leaks.
	Defective or low sensitivity PMT	Check electronics and replace if necessary.
No 4–20 mA dc output current	Incorrect or damaged wiring[2]	Check wiring diagrams to ensure 4–20 mA dc signal connected to proper terminals with correct polarity. Check for short or open in wiring.
Inaccurate 4–20 mA dc output current	Incorrect or damaged wiring[2]	Check wiring diagrams to ensure 4–20 mA dc signal connected to proper terminals with correct polarity. Check for short or open in wiring.
Unstable span	Flasher lamp	Replace with known good lamp to see if problem is resolved.
	Internal instrument leak	Check for leaks.
	Lamp trigger pack	Replace.
Low lamp intensity	Flasher lamp	Ensure lamp and trigger pack are securely fastened.

[1] Determine the alarm type by accessing the View/Ack Alarm menu.

[2] Fault on the I/O PCB.

CRRM0000101

Chapter 9: Support

Contact Information

The local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also obtain support by contacting Thermo Scientific directly.

Process Instruments	
1410 Gillingham Lane Sugar Land, TX 77478 USA +1 (800) 437-7979 +1 (713) 272-0404 direct +1 (713) 4573 fax	Ion Path, Road Three Winsford, Cheshire CW7 3GA UNITED KINGDOM +44 (0) 1606 548700 +44 (0) 1606 548711 fax
Units 702-715, 7th Floor Tower West Yonghe Plaza Andingmen East Street 100007 Beijing CHINA +86 (10) 8419-3588 +86 (10) 8419-3580 fax	A-101, 1CC Trade Tower Senapati Bapat Road Pune 411 016 INDIA +91 (20) 6626 7000 +91 (20) 6626 7001 fax
www.thermoscientific.com	

For returns, contact Thermo Scientific for specific instructions. If it becomes necessary to contact Thermo Scientific with software or hardware problems, please have information on the ranges and installed options available.

Note In the interest of completeness, manuals and drawings included with the system may provide information pertaining to options not included with your system. Information in application notes supersedes general information in these documents. ▲

Additional information can be obtained from the following sources:

- System drawings
- Application notes for the supplied system
- Manuals and data sheets for other associated equipment

The application notes supplied with each system include information specific to the configuration of the installed system. These notes will typically include pressure settings, flow settings, temperature settings and other special situations or adjustments.

CRRM0000102

Warranty

Thermo Scientific products are warranted as free from defects in material and workmanship, either for 12 months from date of installation or 18 months from date of shipment, whichever occurs earlier. Any claimed defects of Thermo Scientific products must be reported within the warranty period. Thermo Scientific shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to the Thermo Scientific plant.

In the event Thermo Scientific requests the return of its products, Buyer shall ship with transportation charges paid by the Buyer to the Thermo Scientific plant. Shipment of repaired or replacement goods from the Thermo Scientific plant shall be F.O.B. Thermo Scientific plant. The customer will receive a quotation of proposed work before repair work begins. Thermo Scientific shall be liable only to replace or repair, at its option, free of charge, products that are found by Thermo Scientific to be defective in material or workmanship, and which are reported to Thermo Scientific within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Scientific.

Thermo Scientific shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Scientific or its Sales Representatives are not followed concerning methods of operation, usage and storage, or exposure to harsh conditions.

Materials and/or products furnished to Thermo Scientific by other suppliers shall carry no warranty, with the exception of suppliers' warranties as to materials and workmanship. Thermo Scientific disclaims all warranties, expressed or implied, with respect to such products.

EXCEPT AS OTHERWISE AGREED TO IN WRITING BY Thermo Scientific, THE WARRANTIES GIVEN ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND Thermo Scientific HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

Items Not Covered Under Warranty

The following parts are considered consumable items and are not covered under the warranty:

- Injection valve and associated parts
- Inline filter
- UV lamp
- Combustion tube, quartz
- Pyrolyzer O-Ring, silicone
- Combustion tube graphite ferrules

Appendix A: Watlow EZ Zone® PM6 Series

Controller Description

The Watlow EZ-ZONE® PM6 series controller is used to control the temperatures of the pyrolyzer furnace and the analyzer oven. The controller provides a signal output if the zone temperature is outside a specified range.

This appendix provides basic operating instructions and default configuration settings. For complete operating information and troubleshooting, refer to the EZ-ZONE PM PID Controller user's manual.

Hardware Setup

The EZ-ZONE PM6 is wired at the factory according to your application.

No other hardware settings are required.

Display & Keys

The display and keys on the EZ-ZONE PM6 are shown below and described in the table that follows.

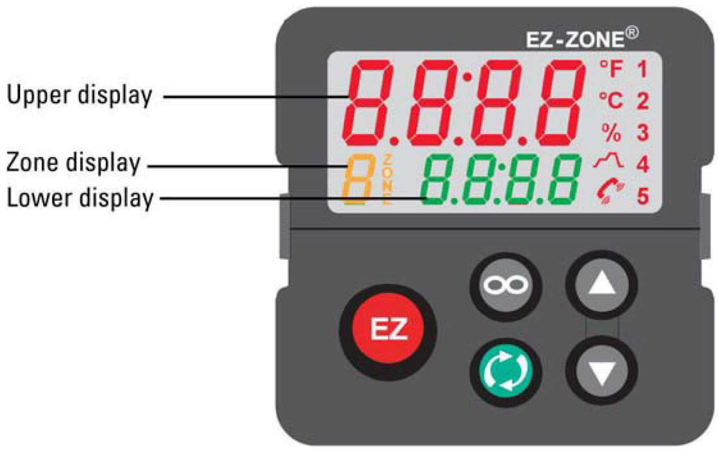
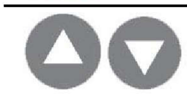


Figure A–1. EZ-ZONE PM6 series controller

CRRM0000106

Table A–1. Controller display & keys

Display/Key	Description
Upper display	When in the Home page, displays the process value. Otherwise, the upper display shows the value of the parameter in the lower display.
Zone display	Indicates the controller zone: 1-9 = Zones 1 through 9 A = Zone 10 b = Zone 11 C = Zone 12 d = Zone 13 E = Zone 14 F = Zone 15 h = Zone 16
Lower display	Indicates the set point or output power value during operation, or the parameter associated with the value shown in the upper display.
°F , °C	Indicates whether the temperature is displayed in degrees Fahrenheit or Celsius.
%	The percent LED lights when values are displayed as a percentage or when the open-loop set point is displayed.
	This LED indicates the status of a profile. When lit, a profile is running. When flashing, a profile is paused.
	Indicates communication activity by flashing when another device is communicating with the controller.
1 through 5	The number LEDs indicate output activity.
	Press the Infinity key to back up one level, or press and hold the key for two seconds to return to the Home page. Once on the Home page, this key may be used to clear alarms and errors (if they may be cleared).
	Press the Advance key to enter the selected menu.
	When in the Home page, use the Up and Down keys to adjust the set point in the lower display. When in other pages, use the keys to change the upper display to a higher or lower value or to change a parameter selection.

Software Configuration

There are two ways to configure the EZ-ZONE PM6. You can use the menu system built into the controller and configure it using the display and appropriate keys to navigate through the system, or alternatively, you can use the EZ-ZONE Configurator software. Instructions for both methods of configuration are provided in the EZ-ZONE PM PID Controller user's manual.

The built-in menu system and configuration software have the following main pages.

- Setup page: Used to set up a control prior to operation.
- Operations page: Used to monitor or change runtime settings.
- Factory Page: Used to enable password protection, create a custom Home Page, and perform other tasks that do not have an effect on the control when running.
- Home Page: The page that is displayed when the control is initially powered up.

Parameters for the EZ-ZONE PM6 are set to the optimum values for your application at the factory. The defaults settings are provided here in the event the configuration is changed without authorization.

Caution Changing the parameters may adversely affect system performance. ▲

Pyrolyzer Settings

The default settings for the pyrolyzer are provided in the tables on the following pages.

Table A–2. Pyrolyzer settings: Setup Page > Analog Input 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
SEn	Sensor Type	tC	Thermocouple	
L in	TC Linearization	S	S	For Type S thermocouple
F iL	Filter		0.5	For smoothing the process signal.
i.Er	Input Error Latching	oFF	Off	
dEC	Display Precision	0	Whole	

Table A–3. Pyrolyzer settings: Setup Page > Control Loop 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
h.Ag	Heat Algorithm	Pid	PID	The method of heat control.
C.Ag	Cool Algorithm	oFF	Off	
t.tUn	TRU-TUNE+ Enable	no	No	
t.Agr	Autotune Aggressiveness	Crit	Critical	Critical damped aggressiveness of autotuning calculations.
UFA	User Failure Action	USEr	User	When user switches to manual mode, controller sets output power to last open-loop set point entered by user.
FAiL	Input Error Failure	oFF	Off	When an input error switches control to manual mode, controller sets output to 0%.
L.dE	Open Loop Detect Enable	no	No	
rP	Ramp Action	oFF	Off	
L.SP	Low Set Point		0°C	The minimum value of the closed loop set point range.
h.SP	High Set Point		1150°C	The maximum value of the closed loop set point range.
SP.Lo	Set Point Open Limit Low		-100.0%	The minimum value of the open loop set point range.
SP.hi	Set Point Open Limit High		100.0%	The maximum value of the open loop set point range.

Table A–4. Pyrolyzer settings: Setup Page > Output 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
Fn	Output Function	hEAt	Heat	
o.Ct	Output Control	Ftb	Fixed Time Base	
o.tb	Output Time Base		0.5	
o.Lo	Output Low Power Scale		0%	The power output will never be less than the value specified and will represent the value at which output scaling begins.
o.hi	Output High Power Scale		15%	The power output will never be greater than the value specified and will represent the value at which output scaling stops.

Table A–5. Pyrolyzer settings: Setup Page > Output 2

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
Fn	Output Function	ALM	Alarm	
Fi	Output Function Instance		1	

Table A–6. Pyrolyzer settings: Setup Page > Alarm1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
A.ty	Alarm Type	dE.AL	Deviation Alarm	
A.hy	Alarm Hysteresis		2°C	
A.Lg	Alarm Logic	AL.o	Open On Alarm	The output condition during an alarm state.
A.Sd	Alarm Sides	both	Both	Both high and low sides can trigger the alarm.
A.LA	Alarm Latching	nLAt	Non-Latching	
A.bL	Alarm Blocking	oFF	Off	
A.Si	Alarm Silencing	oFF	Off	
A.dSP	Alarm Display	on	On	An alarm message will display when an alarm is active.
A.dL	Alarm Delay Time		0	

Table A–7. Pyrolyzer settings: Setup Page > Function Key

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
LEv	Active Level	high	High	
Fn	Action Function	uSr.r	User Set Restore	
Fi	Function Instance		1	

Table A–8. Pyrolyzer settings: Setup Page > Global1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
C_F	Display Units	C	C	Display units are in °C.
AC.LF	AC Line Frequency	60	60 Hz	The frequency to the applied AC line power source.
C.LEd	Communications LED Action	both	Both	Both comm port 1 and 2 selected.
ZonE	Zone	oFF	Off	
ChAn	Channel	on	On	The Channel LED is on.
d.Pr5	Display Pairs		1	The number of display pairs.
d.ti	Display Time		0	The time delay for toggling between channel 1 and channel 2.
USr.S	User Settings Save	nonE	None	
USr.r	User Settings Restore	nonE	None	

Table A–9. Pyrolyzer settings: Operations Page > Analog Input 1

Parameter		Description	
Display	**Software**		
A in	Analog Input Value	The process value (°C).	
i.Er	Input Error	The cause of the most recent error. Possible displays listed below.	
		nonE	None
		OPEn	Open
		FAiL	Fail
		Shrt	Shorted
		E.m	Measurement Error
		E.CAL	Bad Calibration Data
		Er.Ab	Ambient Error
		E.rtd	RTD Error
		nSrc	Not Sourced
i.CA	Calibration Offset	The offset applied to the input reading to compensate factors that cause the input reading to vary from the actual process value (°C). Default = 0.	

Table A–10. Pyrolyzer settings: Operations Page > Monitor 1

Parameter		Description	
Display	Software		
C.MA	Control Mode Active	The control mode currently in effect. Possible displays listed below.	
		oFF	Off
		AUto	Auto
		MAn	Manual
h.Pr	Heat Power	The current heat output level (%).	
C.Pr	Cool Power	The current cool output level (%).	
C.SP	Closed-Loop Set Point	The set point currently in effect (°C).	
Pu.A	Process Value Active	The current filtered process value using the control input (°C).	

Table A–11. Pyrolyzer settings: Operations Page > Control Loop 1

Parameter		Default		Comment
Display	Software	Display	Software	
C.M	Control Mode	AUto	Auto	The loop will use automatic control.
A.tSP	Autotune Set Point		90%	The percentange of the current set point that will be used by autotune.
AUt	Autotune	no	No	
C.SP	Closed-Loop Set Point		1100°C	The set point the controller will automatically control to.
id.S	Idle Set Point		24°C	The closed loop set point that can be triggered by an event state.
h.Pb	Heat Proportional Band		14°C	The PID proportional band for the heat outputs.
h.hY	Heat Hysteresis		2°C	The process value needs to be this far into the On region before the output turns on.
C.Pb	Cool Proportional Band		14°C	The PID proportional band for the cool outputs.
C.hY	Cool Hysteresis		2°C	The process value needs to be this far into the On region before the output turns on.
ti	Time Integral		180	The PID integral (seconds).
td	Time Derivative		0	The PID derivative (seconds).
db	Dead Band		0°C	The offset to the proportional band.
o.SP	Open Loop Set Point		0.0%	The fixed level of output power when in manual (open loop) mode.

Table A–12. Pyrolyzer settings: Operations Page > Alarm 1

Parameter		Default		Comment
Display	Software	Display	Software	
A.Lo	Alarm Low Set Point		-5°C	The set point that will trigger a low alarm.
A.hi	Alarm High Set Point		5°C	The set point that will trigger a high alarm.

Table A–13. Pyrolyzer settings: Factory Page > Custom Setup 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AC.Pu	Active Process Value	The parameter that will appear in the custom Home Page.
iid	Instance ID		1	

Table A–14. Pyrolyzer settings: Factory Page > Custom Setup 2

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AC.SP	Active Set Point	The parameter that will appear in the custom Home Page.
iid	Instance ID		1	

Table A–15. Pyrolyzer settings: Factory Page > Custom Setup 3

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AUt	Autotune	The parameter that will appear in the custom Home Page.
iid	Instance ID		1	

Table A–16. Pyrolyzer settings: Lock Page > Lock 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
LoC.o	Operations Page		2	The security level of the Operations Page.
PAS.E	Password Enable	oFF	Off	
rLoC	Read Lock		1	The level of read security clearance.
SLoC	Write Security		0	The level of write security clearance.
LoC.L	Locked Access Level		1	
roLL	Rolling Password	oFF	Off	
PAS.u	User Password		63	
PAS.A	Administrator Password		156	

Oven Settings

The default settings for the pyrolyzer are provided in the tables on the following pages.

Table A–17. Oven settings: Setup Page > Analog Input 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
SEn	Sensor Type	r0.1H	RTD 100 Ohm	
Lin	TC Linearization	S	S	For Type S thermocouple
rt.L	RTD Leads	2	2	The number of leads on the RTD wired to this input.
Unit	Units	Pro	Process	The type of units measured by the sensor.
S.Lo	Scale Low		0.00	The low scale for process inputs.
S.hi	Scale High		20.00	The high scale for process inputs.
r.Lo	Range Low		-18.0°C	The output low range.
r.hi	Range High		5537.0°C	The output high range.
P.EE	Process Error Enable	oFF	Off	
P.EL	Process Error Low Value		0.00	
FiL	Filter		0.5	For smoothing the process signal.
i.Er	Input Error Latching	oFF	Off	
dEC	Display Precision	0.0	Tenths	

Table A–18. Oven settings: Setup Page > Control Loop 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
h.Ag	Heat Algorithm	PId	PID	The method of heat control.
C.Ag	Cool Algorithm	oFF	Off	
t.tUn	TRU-TUNE+ Enable	no	No	
t.bnd	TRU-TUNE+ Band		0°C	
t.gn	TRU-TUNE+ Gain		3	
t.Agr	Autotune Aggressiveness	CrIt	Critical	Critical damped aggressiveness of autotuning calculations.
P.dL	Peltier Delay		0.0	
UFA	User Failure Action	USEr	User	When user switches to manual mode, controller sets output power to last open-loop set point entered by user.
FAiL	Input Error Failure	oFF	Off	When an input error switches control to manual mode, controller sets output to 0%.
MAn	Fixed Power		0.0%	
L.dE	Open Loop Detect Enable	no	No	
L.dt	Open Loop Detect Time		240	
L.dd	Open Loop Detect Deviation		6.0°C	
rP	Ramp Action	oFF	Off	
r.SC	Ramp Scale	Min	Minutes	
r.rt	Ramp Rate		1.0°C	
L.SP	Low Set Point		0°C	The minimum value of the closed loop set point range.
h.SP	High Set Point		130.0°C	The maximum value of the closed loop set point range.
SP.Lo	Set Point Open Limit Low		-100.0%	The minimum value of the open loop set point range.
SP.hi	Set Point Open Limit High		100.0%	The maximum value of the open loop set point range.

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Table A–19. Oven settings: Setup Page > Output 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
Fn	Output Function	hEAt	Heat	
Fi	Output Function Instance		1	
o.Ct	Output Control	Ftb	Fixed Time Base	
o.tb	Output Time Base		0.5	
o.Lo	Output Low Power Scale		0%	The power output will never be less than the value specified and will represent the value at which output scaling begins.
o.hi	Output High Power Scale		70%	The power output will never be greater than the value specified and will represent the value at which output scaling stops.

Table A–20. Oven settings: Setup Page > Output 2

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
Fn	Output Function	ALM	Alarm	
Fi	Output Function Instance		1	

Table A–21. Oven settings: Setup Page > Alarm 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
A.tY	Alarm Type	dE.AL	Deviation Alarm	
A.hY	Alarm Hysteresis		2°C	
A.Lg	Alarm Logic	AL.o	Open On Alarm	The output condition during an alarm state.
A.Sd	Alarm Sides	both	Both	Both high and low sides can trigger the alarm.
A.LA	Alarm Latching	nLAt	Non-Latching	
A.bL	Alarm Blocking	oFF	Off	
A.Si	Alarm Silencing	oFF	Off	
A.dSP	Alarm Display	on	On	An alarm message will display when an alarm is active.
A.dL	Alarm Delay Time		0	

Table A–22. Oven settings: Setup Page > Function Key 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
LEv	Active Level	high	High	
Fn	Action Function	uSr.r	User Set Restore	
Fi	Function Instance		1	

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Table A–23. Oven settings: Setup Page > Global 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
C_F	Display Units	C	C	Display units are in °C.
AC.LF	AC Line Frequency	60	60 Hz	The frequency to the applied AC line power source.
C.LEd	Communications LED Action	both	Both	Both comm port 1 and 2 selected.
ZonE	Zone	oFF	Off	
ChAn	Channel	on	On	The Channel LED is on.
d.Pr S	Display Pairs		1	The number of display pairs.
d.t i	Display Time		0	The time delay for toggling between channel 1 and channel 2.
USr.S	User Settings Save	nonE	None	
USr.r	User Settings Restore	nonE	None	

Table A–24. Oven settings: Operations Page > Analog Input 1

Parameter		Description	
Display	**Software**		
A in	Analog Input Value	The process value (°C).	
i.Er	Input Error	The cause of the most recent error. Possible displays listed below.	
		nonE	None
		OPEn	Open
		FA iL	Fail
		Shrt	Shorted
		E.m	Measurement Error
		E.CAL	Bad Calibration Data
		Er.Ab	Ambient Error
		E.rtd	RTD Error
		nSrc	Not Sourced
i.CA	Calibration Offset	The offset applied to the input reading to compensate factors that cause the input reading to vary from the actual process value (°C). Default = 0.	

Table A–25. Oven settings: Operations Page > Monitor 1

Parameter		Description	
Display	Software		
C.MA	Control Mode Active	The control mode currently in effect. Possible displays listed below.	
		oFF	Off
		AUto	Auto
		MAn	Manual
	Heat Power	The current heat output level (%).	
	Cool Power	The current cool output level (%).	
	Closed-Loop Set Point	The set point currently in effect (°C).	
	Process Value Active	The current filtered process value using the control input (°C).	

Table A–26. Oven settings: Operations Page > Control Loop 1

Parameter		Default		Comment
Display	Software	Display	Software	
C.M	Control Mode	AUto	Auto	The loop will use automatic control.
A.tSP	Autotune Set Point		90%	The percentange of the current set point that will be used by autotune.
AUt	Autotune	no	No	
C.SP	Closed-Loop Set Point		110.0°C	The set point the controller will automatically control to.
id.S	Idle Set Point		25.0°C	The closed loop set point that can be triggered by an event state.
h.Pb	Heat Proportional Band		14.0°C	The PID proportional band for the heat outputs.
h.hY	Heat Hysteresis		2.0°C	The process value needs to be this far into the On region before the output turns on.
C.Pb	Cool Proportional Band		14.0°C	The PID proportional band for the cool outputs.
C.hY	Cool Hysteresis		2.0°C	The process value needs to be this far into the On region before the output turns on.
ti	Time Integral		180	The PID integral (seconds).
td	Time Derivative		0	The PID derivative (seconds).
db	Dead Band		0.0°C	The offset to the proportional band.
o.SP	Open Loop Set Point		0.0%	The fixed level of output power when in manual (open loop) mode.

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Table A–27. Oven settings: Operations Page > Alarm 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
A.Lo	Alarm Low Set Point		-5°C	The set point that will trigger a low alarm.
A.hi	Alarm High Set Point		5°C	The set point that will trigger a high alarm.

Table A–28. Oven settings: Factory Page > Custom Setup 1

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AC.Pu	Active Process Value	The parameter that will appear in the custom Home Page.
i id	Instance ID		1	

Table A–29. Oven settings: Factory Page > Custom Setup 2

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AC.SP	Active Set Point	The parameter that will appear in the custom Home Page.
i id	Instance ID		1	

Table A–30. Oven settings: Factory Page > Custom Setup 3

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
PAr	Parameter	AUt	Autotune	The parameter that will appear in the custom Home Page.
i id	Instance ID		1	

Table A–31. Oven settings: Lock Page > Lock

Parameter		Default		Comment
Display	**Software**	**Display**	**Software**	
LoC.o	Operations Page		2	The security level of the Operations Page.
PAS.E	Password Enable	oFF	Off	
rLoC	Read Lock		1	The level of read security clearance.
SLoC	Write Security		0	The level of write security clearance.
LoC.L	Locked Access Level		1	
roLL	Rolling Password	oFF	Off	
PAS.u	User Password		63	
PAS.A	Administrator Password		156	

The Lockout Menu

Each menu has a security level assigned to it. You can change the read and write access to these menus and pages through the Lockout menu [LoC]. These security functions are described in detail in the EZ-ZONE PM PID Controller user’s manual.

Appendix B: Rotary Valve Service

All SOLA II Flare analyzers use 10- and 6-port rotary injection valves, plus a 4-port range select valve. This appendix references a typical 6-port rotary injection valve. These are manufactured by Valco Instruments Co. Inc. (VICI). This appendix describes operation and cleaning instructions for the valves typically used. The material in this appendix is taken from VICI Technical Note 201 (TN-201 9/00), copyright 2000 VICI and from VICI Technical Note 409 (TN-409 4/01), copyright 2001 VICI. Technical Notes used with permission (www.VICI.com).

Caution The sample line must be purged with air to remove all sample prior to performing valve maintenance to prevent sample leaking to the pyrolyzer. Open the oven and disconnect the tubing from the injection valve to the pyrolyzer before servicing the valve. ▲

Initial Precautions

After unpacking the valve, do not remove the protective tape from the valve ports until you are ready to install the valve. As supplied, all surfaces are clean and free of contaminants, and must be kept clean to prevent valve damage. Open ports and fittings cause unnecessary risk of particulate matter entering the valve and scratching the sealing surfaces, which is the most frequent cause of premature valve failure.

Note For Valco W and UW Type valves. ▲

Note The most common source of particulate and chemical contamination is tubing which has not been properly cleaned before installation in the valve. To avoid this problem, Valco Instruments suggests using their electrolytically pre-cut and polished tubing, available in standard lengths for any plumbing requirement. ▲

Note If other tubing is to be used, make certain that all tubing ends are free of burrs and cut square with the tube axis, and that all tubing has been chemically and mechanically cleaned. ▲

Note Failure to observe proper cleanliness procedures during installation of the valve voids the manufacturer's warranty. ▲

Make sure that tubes are seated completely before forming the one-piece Valco ferrule on the tube. This ensures that the minimum connection volume is obtained. (For more information on installing fittings, refer to VICI Technical Note 503, Fitting Instructions).

Valve Disassembly

Caution Do not disassemble the valve unless the system malfunction is definitely isolated to the valve; perform all other system checks first. If disassembly is required, make certain that the following instructions are carefully observed. ▲

Disassembly operations must be performed in a clean, well-lighted area. Flush all hazardous or toxic materials from the valve before starting. Please read the entire procedure before beginning.

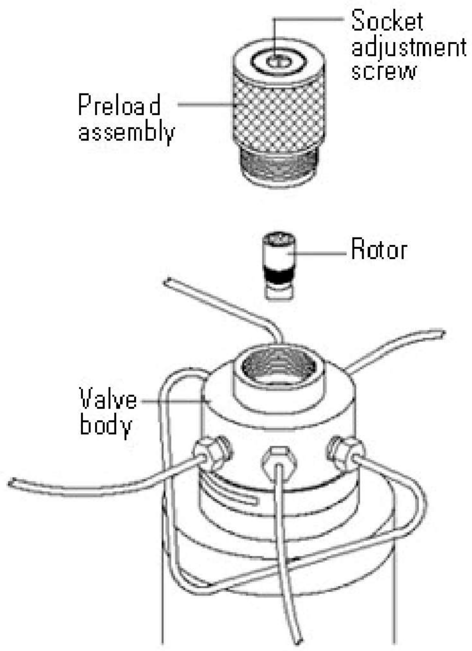

Figure B–1. Rotary valve disassembly

As this figure illustrates, the valve can be disassembled for cleaning and/or rotor replacement without removing the loops and tubing from the valve or removing the valve from the actuator or mounting bracket.

1. Unscrew the entire knurled preload assembly. Do not tamper with the preset socket adjustment screw.
2. Engage the end of the rotor with a pencil-type magnet, available from VICI or any electronic components supplier. Cycle the valve one time to break the shear seal between the rotor and the valve body.

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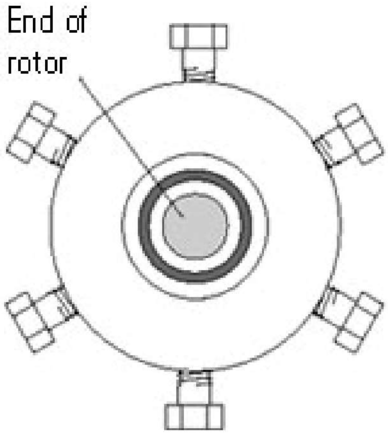

Figure B–2. Preload removed (preload end view)

Caution Any contact between the interior of the valve body and the metal of the rotor or any tool used is likely to cause damage. ▲

Carefully withdraw the rotor from the valve body with the magnet. Once the rotor is removed, note the orientation of the rotor tab, which is marked with an ID letter denoting the type of seal material.

Cleaning the Valve Body

Follow these instructions to clean the valve body.

1. Wet a cotton swab with a solvent compatible with the chromatographic system. Isopropyl alcohol is recommended.
2. Gently swab the polished interior of the valve to remove any loose residue.
3. Blow with clean compressed gas to remove any lint left by the swab.
4. Visually inspect the interior of the valve body. The conical surface should appear highly polished. If any scratches are visible between the ports or anywhere that might suggest a potential leakage path or wear source, the valve should be returned to the factory for grinding and polishing.

Cleaning the Rotor

1. Carefully grasp the rotor on either end and briefly immerse it in solvent. If it is difficult to grip the rotor securely, hemostats or needle- nosed pliers may be helpful. Grip the tab end, being careful not to mar the metal or touch the polymer.
2. Gently wipe the polymer with a clean tissue.
3. Blow with clean compressed gas to remove any lint left by the tissue.
4. Visually inspect the rotor. If it shows any scratches and/or a narrowing of the flow passages, replacement is necessary.

Rotor Assembly

1. Place the clean rotor on the pencil magnet and orient it so that the tab properly engages the slot of the drive mechanism. The list in Figure B–3 shows how to orient the ID letter for different VICI valves (A C6W is shown in Figure B–4).
2. Insert the rotor into the valve body, being careful that the tab does not touch the polished interior of the valve body. Make sure the rotor tab (Figure B–4) is fully inserted into the slot in the driver.
3. Using a pencil or other small pointed object, hold the rotor in place in the valve body while pulling the magnet free.
4. Replace the knurled preload assembly, tightening it into the valve body by hand just beyond the point where it touches the rotor. Cycle the valve 10 times to seat the sealing surfaces, leaving the valve fully in its clockwise or counterclockwise position.
5. Tighten the preload in quarter-turn increments, cycling the valve 10 times after each step. The preload must end up fully bottomed-out, but attempts to further tighten do not affect the sealing forces.

Note Make certain that the valve is never left partially actuated. It should always be in either its fully clockwise or fully counterclockwise position. ▲

Number of ports	ID letter towards
3	Port 2
4	Port 3
6	Port 4
8	Port 5
10	Port 6
Internal sample	Side of valve with four ports

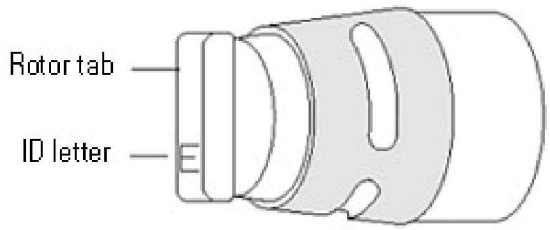

Figure B–3. Location of ID letter on valve rotor

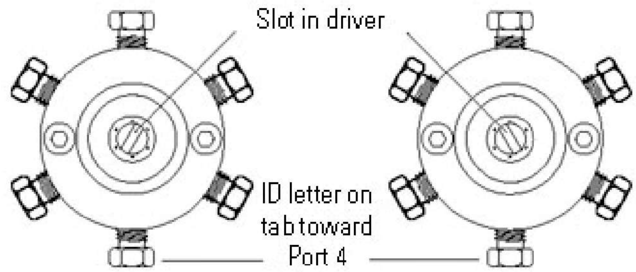

Figure B–4. C6 W valve with preload and rotor removed (preload end view)

High temperature valves require conditioning when the rotor is replaced. If a high temperature valve (WT or UWT series) is used at less than 300°C, it may become sticky or difficult to turn. This tendency can usually be eliminated by repeating the conditioning procedure that is initially done at the factory. With carrier gas (oxygen-free) flowing through all the ports, rapidly heat the valve to 325°C. When this temperature is reached, cycle the valve 10 times and let it cool to operating temperature.

Conditioning Procedure for High Temperature Valves

High temperature valves require conditioning when the rotor is replaced. If a high temperature valve (WT or UWT series) is used at less than 300°C, it may become sticky or difficult to turn. This tendency can usually be eliminated by repeating the conditioning procedure that is initially done at the factory. With carrier gas (oxygen-free) flowing through all the ports, rapidly heat the valve to 325°C. When this temperature is reached, cycle the valve 10 times and let it cool to operating temperature.

Two-Position Air Actuator O-Ring Replacement

You will need the following to perform the tasks described in this section.

- 9/64” hex driver
- 3/8” open-end wrench
- 3/16” screwdriver
- An awl or small jeweler’s screwdriver
- Silicone lubricant (such as Dow Corning® DC-111)
- Lint-free tissues and a clean shop rag
- Standard O-Ring kit (VICI P/N OR)
- High temperature O-Ring kit (VICI P/N ORT)

Disassembly

1. Apply air pressure to the actuator inlet nearest the valve. Then use the open-end wrench to remove the air supply lines from the actuator.

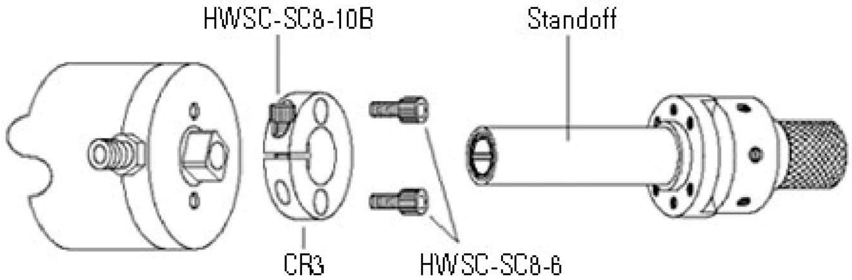

Figure B–5.

2. Remove the valve and valve-mounting hardware from the actuator (as shown in Figure B–5):
   a. Use the 9/64" hex driver to loosen the HWSC-SC8-10B/socket-head screw in the black anodized CR3/clamp ring on the actuator.
   b. Pull off the standoff with the valve attached.
   c. Use the 9/64” hex driver to remove the two HWSC-SC8-6/socket-head screws that hold the clamp ring to the actuator.

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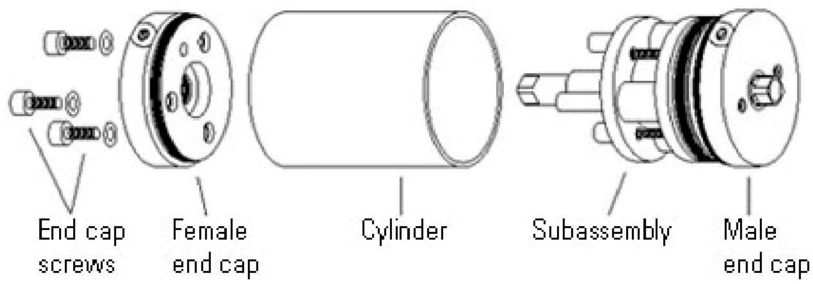

Figure B–6. Steps 3–6

3. Use the 9/64" hex driver to remove the three end cap screws with PEEK washers (some models have slotted head screws instead of hex head).
4. Place the actuator on a hard work surface with the end cap screw holes up. Push down on the cylinder and the female end cap pops up.
5. While holding the cylinder and the rest of the assembly together, pull the female end cap all the way off. If the bearing and washers fall out, set them aside.
6. Repeat the procedure with the actuator inverted, so that the cylinder slides loose from the male end cap. Remove the cylinder.

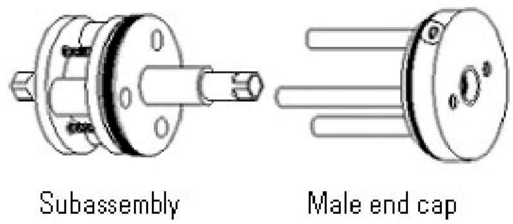

Figure B–7. Steps 7–8

7. Pull the subassembly off the male end cap as indicated in Figure B–7.

Note Recently purchased actuators may have a subassembly made primarily of molded plastic, differing in appearance from the one shown in previous figures. The procedures are the same for either type. ▲

8. Loosen but do not remove the three slotted head screws that hold the subassembly together.

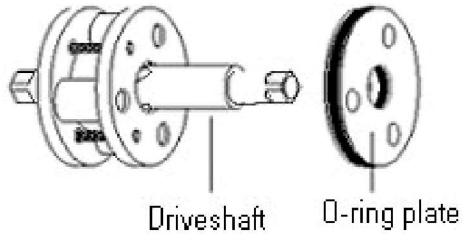

Figure B–8.

9. Take care to hold the rest of the subassembly together, and slide the O-Ring plate off the drive shaft. Refer to reassembly instructions in Assembly if the subassembly does come apart).

Replacement

The O-Rings to be replaced are in the two end caps and the O-Ring plate. The internal end cap O-Rings are easier to access if the washers and bearing are removed. Follow the steps below.

1. Use a small screwdriver or awl to remove the old O-Rings, being careful not to scratch the metal.
2. Use a lint-free tissue to clean the O-Ring grooves as completely as possible.
3. Upon installation, coat each new O-Ring with a thin layer of Dow Corning DC-111 (or similar silicone lubricant).

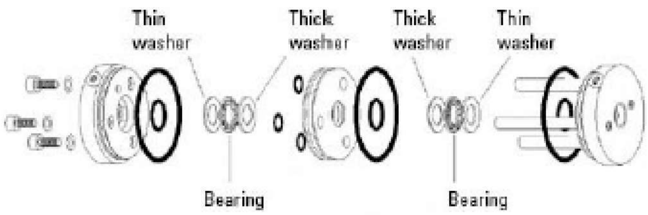

Figure B–9. Locations of O-Rings

Assembly

Where possible, apply a slight rotating action to the parts as they go over or through the O-Rings to help prevent any nicking or tearing of the new parts.

1. Being careful that the subassembly does not come apart, gently push the O-Ring plate onto the drive shaft. Make sure that the threaded holes in the plate are facing the subassembly.

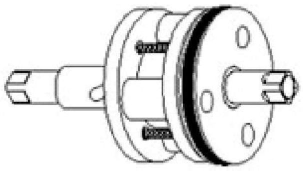

Figure B–10.

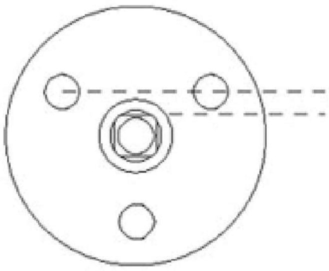

Figure B–11.

2. Screw the slotted-head screws into the O-Ring plate, and push the drive shaft into the O-Ring plate as far as it will go, as shown in Figure B–10.
3. Place the washers and bearing in the male end cap (thin washers in first, as shown Figure B–9). One of the flats on the drive shaft lines up with a line drawn between two of the holes in the O-Ring plate (Figure B–11).
4. Slide the subassembly onto the pins of the male end cap with this flat lined up with the air inlet on the end cap.
5. Install the cylinder, sliding it over the subassembly and pressing the male end cap into it.
6. Place the washers and bearing in the female end cap. Press the end cap into the cylinder, making sure that the air inlet hole is in the same orientation as the one in the male end cap.
7. Install the three end cap screws with the PEEK washers provided.
8. Replace the valve mounting hardware and air supply lines.

9. Apply air pressure to the actuator inlet nearest the valve so that the actuator is in the same position as it was when the valve was removed.
10. Slide the valve with its standoff into the clamp ring, making sure that the square hole in the valve coupling or in the end of the standoff drive shaft is fully engaged by the square of the actuator drive shaft. Tighten the clamp ring screw.

Valve Alignment

Valves installed using two 3-way solenoids or a Valco Digital Valve.

Interface do not maintain actuation force after they have been actuated. For accurate valve alignment, a temporary method of supplying continuous air pressure to the selected actuator inlet must be contrived. Follow the instructions below.

1. Switch the actuator from one position to the other several times to make sure that the play in the coupling mechanism has been absorbed.
2. Visually inspect the valve body cutout to determine if the rotor pin is against the stop. If so, proceed to step 3. If not, skip to step 4.
3. Switch the actuator to its other position and repeat the visual inspection. If the rotor pin is touching the stop in this position also, the valve and actuator are properly aligned. If the pin does not touch the stop, proceed with step 4.
4. Switch the actuator to the other position.
5. Slowly loosen the clamp ring screw until the valve body moves, indicating that the actuator has traveled to the end of its stroke. Immediately retighten the clamp ring screw.
6. Repeat the visual inspection. If the steps have been executed correctly, the rotor pin should contact the stops in both positions. If it does not, repeat the entire procedure.

Rebuild the Assembly

Follow these steps to rebuild the subassembly:

1. Put a liberal coating of Dow Corning DC-111 on the slots in the drive shaft.
2. Place the ball retainer over the shaft so that the holes in the retainer line up with the slots in the shaft.
3. Put the balls in the holes of the retainer so that they rest in the slots. They should be held in place by the thick lubricant.
4. Notice that the slots in the female race extend all the way to one end but not the other. Observe also that one end of the drive shaft has a 1/4" hole. Put that end of the drive shaft into the end of the female race that has the slot openings, sliding the balls into the slots.
5. Place the male end cap on a flat work surface. Set the O-Ring plate on the end cap with the pins lined up to go through the three small O-Rings. Pressing the plate in dislodges the O-Rings; do not press the plate in.
6. The two bearing plates are identical except that one has three countersunk holes to accept the subassembly screw heads. Locate the bearing plate that is not countersunk and line it up on top of the O-Ring plate (if both bearing plates are countersunk, they are interchangeable). Press down to force the pins through the O-Rings and bearing plate, continuing until the two parts are riding about half way down the pins.
7. Slide the three bushings over the pins.
8. Install the drive shaft/ball assembly with the 1/4" hole end down. The female race should between the bushings.
9. Place the remaining bearing plate in position with the countersunk holes up, and screw the entire assembly together. Tighten the screws in rotation to insure optimum alignment.
10. Pull the subassembly off the male end cap so that its orientation can be checked, and proceed with step 2 of Assembly.

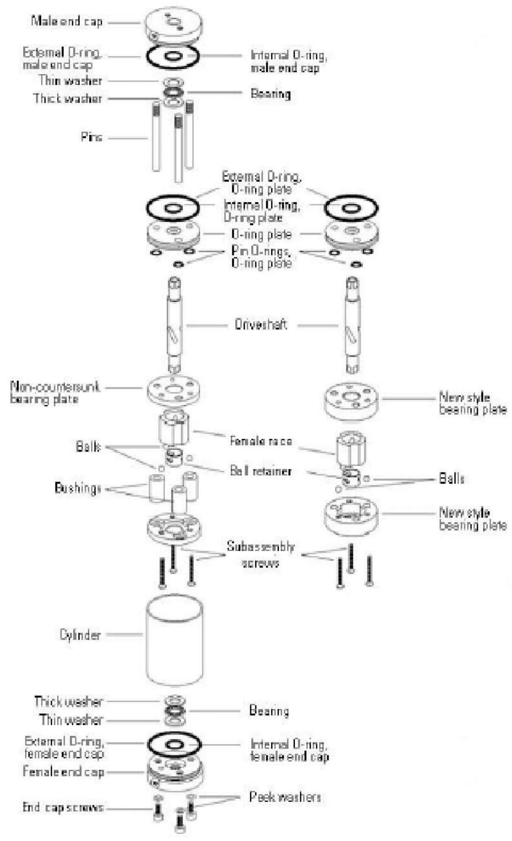

Figure B–12. Exploded view of two-position actuator

CRRM0000136

Appendix C: TCP/IP Bridge

The SOLA II Flare Modbus TCP/IP option is a microprocessor-driven board that provides a bridge between the SOLA II Flare standard serial Modbus and a TCP/IP Modbus network using 10/100 Base-T. This function is provided by the NetBurner™.

Hardware Configuration

- TCP/IP Bridge board installed inside the SOLA II Flare enclosure
- SOLA II Flare Modbus configuration must be set to 38400 baud with Modbus ID 1
- Bridge board has a standard RJ45 connector for the 10/100 Base-T cable

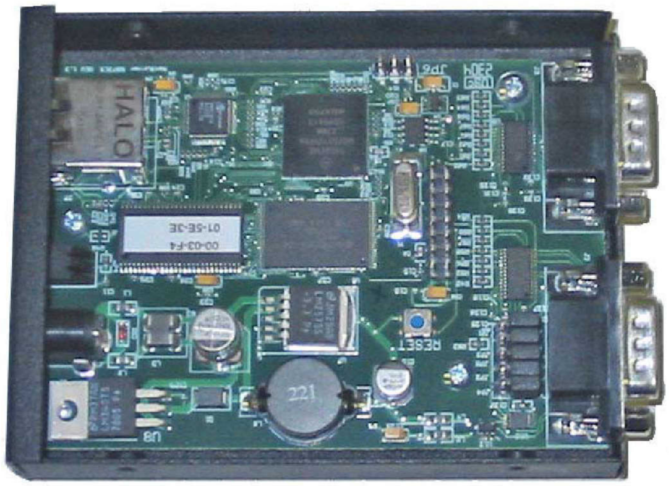

Figure C–1. TCP/IP Ethernet bridge board, P/N 55-1228-0 (newer models)

Software Configuration

As shipped, the Bridge defaults to an IP address of 00.00.00.00. At power- up (with an IP address of 00.00.00.00), the Bridge attempts to negotiate an IP through a DHCP server. If a DHCP server is not available or if it is desired to assign the instrument a static IP, use the provided utility program to set up the IP address. Perform the following steps to search for the Bridge on the network and assign an IP address.

1. Locate the IPSetup.exe utility that is included with the disk that ships with the TCP/IP Bridge option.

2. Run the IPSetup.exe utility from any IBM®-compatible PC connected to the same network as the Bridge. The utility automatically searches the network and reports any bridges found.
3. If more than one bridge is installed on the network, each can be identified by its MAC address. The MAC address is recorded on the label near the RJ45 connector on the Bridge board.
4. Record the IP address assigned to the bridge. This is the IP address required for configuring a workstation or DCS to query the SOLA II Flare. On the TCP/IP Modbus frame, the unit ID must always be set to 1.

Figure C–2. Example display with DHCP server present

To set a static IP, enter the IP address and press the Set--> button.

The SOLA II Flare offers the option for the user to remotely connect to the SOLA II Flare via web browser and be presented with a full representation of the display on the front of the unit. This provides the user with all of the same functionality as standing in front of the unit itself.

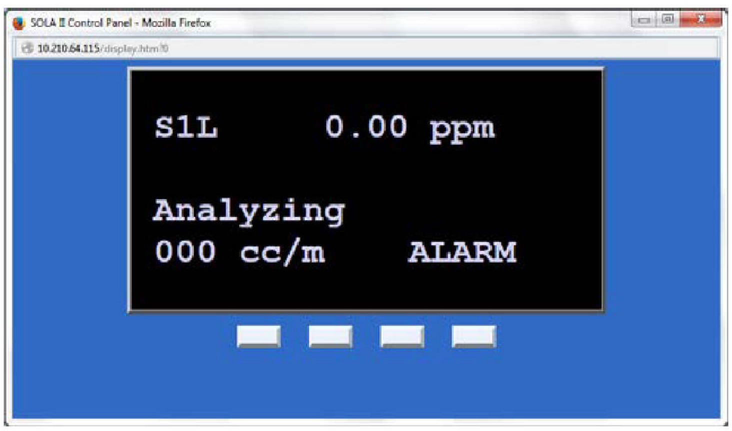

Figure C–3. Browser connect screen

Appendix D: Sample SOLA II Flare Modbus Register

Modbus Map

Note 32-bit integer values are transmitted in two consecutive 16-bit holding registers. The first register contains the most significant word and the next register the least significant.

The SOLA analyzer supports a sub-set of the TCP/IP Modbus Protocol.

Each SOLA requires a unique IP. The identifier is always 1.

Modbus Function Supported:

- Function 01 Read Coils
- Function 02 Read Status Inputs
- Function 03 Read Holding Registers
- Function 04 Read Input Registers
- Function 05 Set Single Coil
- Function 06 Set Single Holding Register
- Function 15 Set Multiple Coils
- Function 16 Set Multiple Holding Registers

Note Register numbering follows the standard Modbus encoding. The actual number sent in the function query is one less than the number referred in the documentation. The most significant number in parenthesis indicates the data type and function used.

To avoid confusion and help in the initial test, a sync register with a constant value is provided so communications between the PLC and the Flares can be verified. ▲

A block of Holding Registers (accessible with functions 03, 06 and 16) are added to the standard SOLA II Flare Modbus Map specially dedicated to the Flare Monitoring Project.

- Holding Registers (16 bits)
- Read Function 03
- Write Functions 06 and 16

Table D–1.

Register #	SOLA II Flare	Comments	
(4)0060	2722	Fix values to verify communication mapping	
(4)0061 (4)0062	Total Sulfur ppm * 10	32-bit integer range 0 to 10000000 Interpreted as xxxxxx.x ppm	
(4)0063	Valve Control*	See I/O Table, Table 2-1	
(4)0064	Alarm Status	Bit Position Encoding (16 bits)	
		(read only register)	
		Bit #	Description
		0	Analyzer Purge Failure
		1	High Lamp Voltage Rate of Change Alarm
		2	Oven/Pyrolyzer Temperature Alarm
		3	Chamber Temperature Alarm
		4	Chamber Flow Alarm
		5	Lamp Voltage Alarm
		6	Reserved (future usage)
		7	Reserved (future usage)
		8	Reserved (future usage)
		9	Reserved (future usage)
		10	Reserved (future usage)
		11	Reserved (future usage)
		12	Reserved (future usage)
		13	Reserved (future usage)
		14	Reserved (future usage)
		15	Reserved (future usage)
(4)0065	Raw Detector Signal	0 to 21000 KHz (recommended historical logging)	
(4)0066	Chamber Flow	cc/minute (recommended historical logging)	
(4)0067	Lamp Intensity	0 to 50000 (recommended historical logging)	
(4)0068	Lamp Voltage	0 to 13000 volts (recommended historical logging)	
(4)0069	Chamber Temperature	Deg °C * 10 (recommended historical logging)	
(4)0070	Flaring Alarm*	Write 1 by DCS to force high cal, cleared by SOLA II Flare	
(4)0071	Start Validation	Starts a remote validation, SOLA II Flare clears it	
(4)0072	Abort Validation	Aborts the validation, SOLA II Flare clears it	
(4)0073	Reserved	Future Usage	
(4)0074	Reserved	Future Usage	
(4)0075	Reserved	Future Usage	

* Must be installed

Appendix E: The Workstation

Installing SOLA II Flare Software

The SOLA II Flare workstation software is an application developed to run under National Instruments Lookout™ software. The software consists of the following items:

- Lookout Development System
- Floppy disk with a subdirectory named SOLA containing the following files:
  - fdcws.l4t
  - fdcws.l4p
  - fdcws.lks
  - fdcws.lka

1. Copy the SOLA subdirectory from the CD to the c:\Program Files\NationalInstruments\Lookout subdirectory on the computer hard drive. Remove the disk from the drive and store in a safe place.
2. Click on fdcws.l4p to open the workstation through Lookout.
3. The workstation is configured to connect to the analyzer using the Com port 1 at 9600 baud and to expect the analyzer Modbus address to be 1. If the analyzer is equipped with the Serial to 10/100 Base-T Bridge or, if a different com port is used in the PC, the Modbus 1 object needs to be edited.
4. Beginning at the Lookout main menu,
   a. Select Edit and switch to edit mode.
   b. Select Object > Modify > Modbus1 (Figure E–1).
   c. Edit the Modbus object to select a different COM port or Modbus Ethernet (Figure E–2).

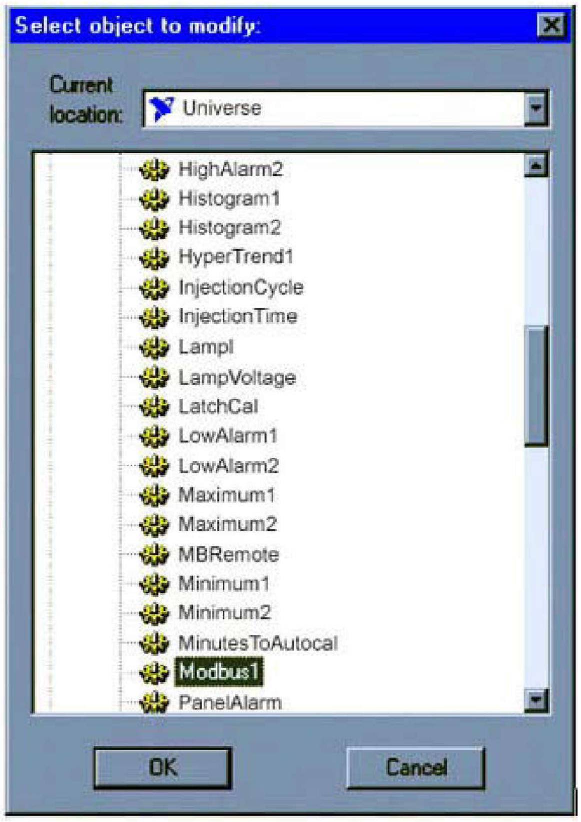

Figure E–1.

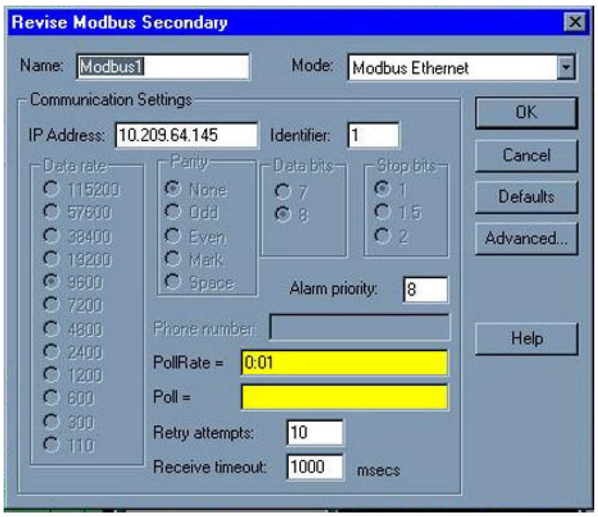

Figure E–2.

5. If Mode is set to Modbus Ethernet:

   a. Set the IP address to the value assigned to the Bridge. The required IP address depends on the configuration of the Modbus Ethernet. Contact the person responsible for this network to obtain the correct IP address.

b. Set the identifier to 1.

6. If a serial port is used for the connection, configure the serial port parameters as follows:

a. Select Lookout Options > Serial Ports.

b. Verify that the port is configured as shown in Figure E–3.

Note The specified Receive gap, RTS delay, and CTS time-out are critical to achieve successful communication with the analyzer. Depending on the PC used, these numbers may need to be increased. ▲

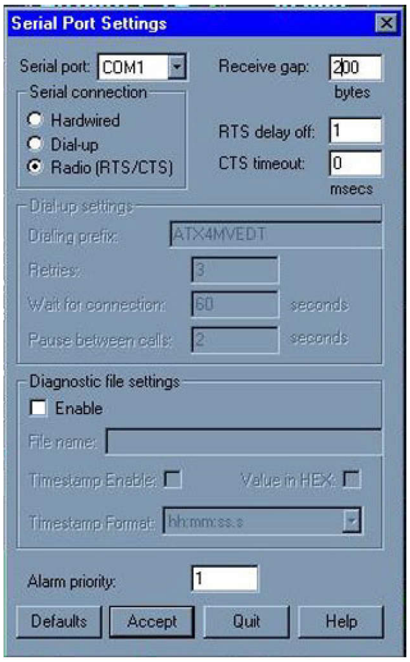

Figure E–3.

Workstation Operation

Using the operation application with Lookout enables you to monitor and control analyzer operation from the remote workstation.

Real-time data from the analyzer is collected, displayed, trended, and archived on the remote computer hard drive. The database files containing analyzer data are accessible by other programs using ODBC or SQL. See the Lookout software manual provided with the system or instructions in the software you are using for more information.

Data from the analyzer is also saved on the hard drive in CSV format for easy use with spreadsheets, databases, statistical analysis, and other software programs. The data is stored in the c:\Program Files\National Instruments\Lookout\sola\directory with subdirectories that match the year, month, and date for the analysis.

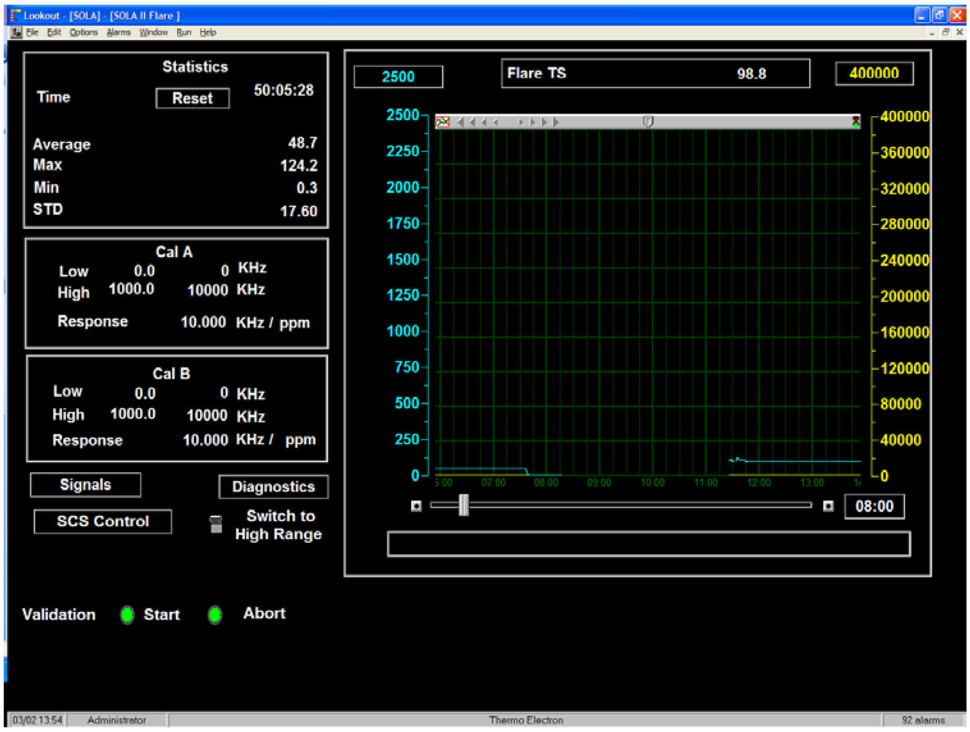

Figure E–4. Workstation main screen

As shown in Figure E–4, the main screen is divided into several operating sectors that are described in the following sections.

Note The workstation collects real-time data form the analyzer. For proper operation, the workstation should be run continuously with a connection to the analyzer. ▲

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Statistics

The left sector displays statistics for the analyses of Cal A and Cal B (if second stream option is installed on the analyzer). Clicking Reset zeroes the statistics and starts accumulation of information. Time period displays the length of time for which the data has been accumulating.

Total Sulfur & Frequency Plot

The Total Sulfur and Frequency Plot area displays the trend of measured total sulfur for Cal A and Cal B.

The arrows (triangles) on the bar along the top of the plot area permit scrolling left or right along the time axis for viewing the plot. When scrolling, the red indicator at the right end of the bar turns on to indicate that viewed data is historical rather than real-time. Clicking the lower indicator of the two turns that indicator green and returns the plot to real- time data display. The total time period displayed on the plot can be varied from 5 minutes to 24 hours by moving the slider below the plot area.

The hyper-cursor in the middle of the upper bar can be selected and moved to any point along the trend to display an instantaneous value of the concentration in percentage of full scale.

Analyzer Status

The two indicators at the lower left of the main screen display the status of the analyzer by placing a green indicator to the right of Validation Start and Abort. If the indicators are not green, the system is running a sample analysis.

Diagnostic Trends

Clicking Diagnostics displays a list of current values for several status monitors and a trend chart showing historical values. These status values are useful for troubleshooting.

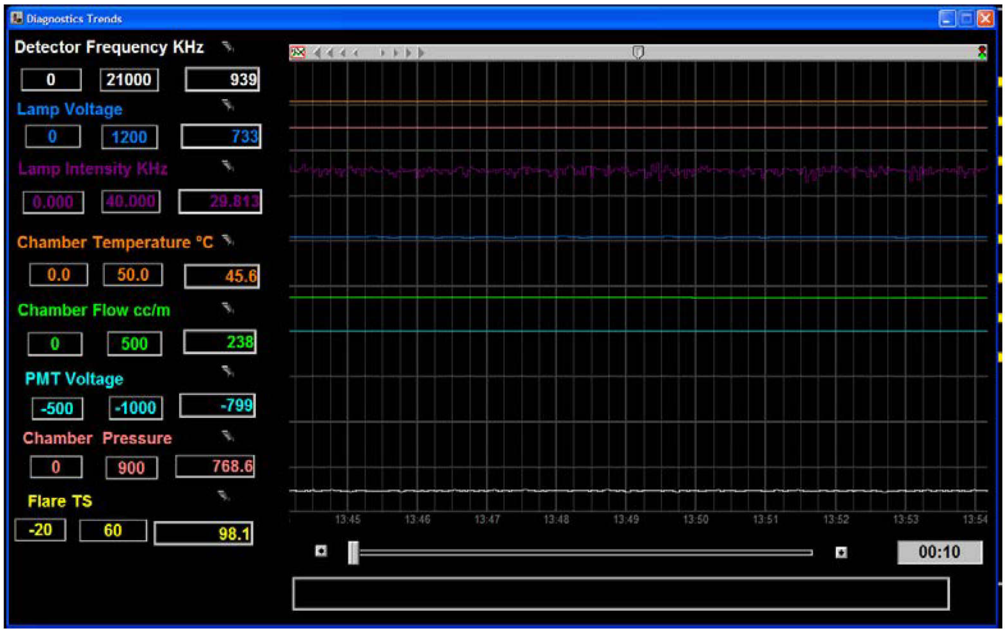

Figure E–5. Diagnostic Trends

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Diagnostic Signals

A user can select the Diagnostics button on the workstation main screen and be presented with a snapshot of seven of the most significant values related to the SOLA II Flare operation.

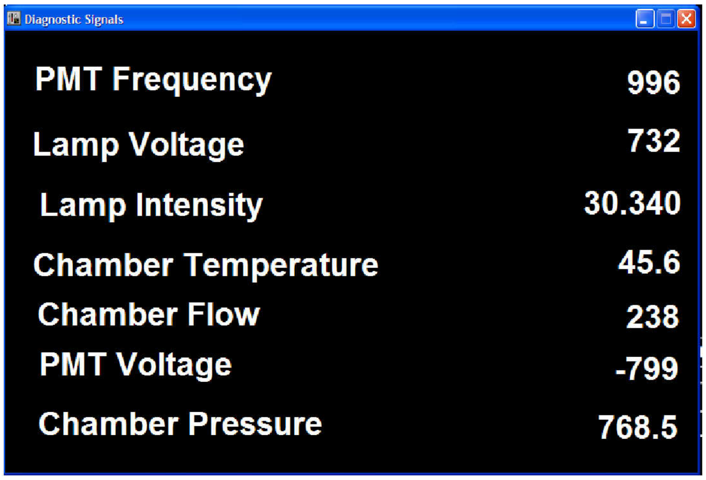

Figure E–6. Diagnostic Signals

SCS Controls

Clicking SCS Control displays a set of selections that allow the user to control the SOLA II Flare validation range. Once a user selects an option, the workstation will send a MODBUS command to the SOLA II Flare unit commanding the unit to change its pneumatic outputs to select one of the 11 available valve configurations.

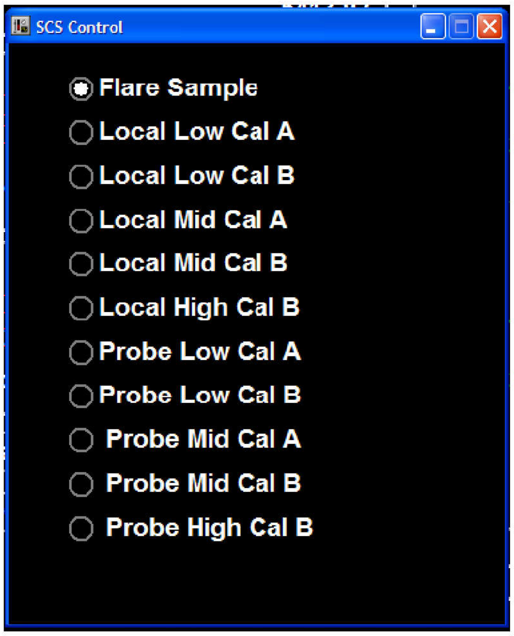

Figure E–7. SCS Control

CRRM0000148

Appendix F: The X-Purge System

Description

The optional X-Purge assembly is used to provide safe operation of analyzer systems in Class 1, Division 1, Groups B, C, and D (NFPA) and Zone 1, Ex d[p] IIC T4 (ATEX and IECEx) hazardous areas. Safe operation is achieved by automatically disconnecting power from the analyzer system if the purge pressure is lost in any of the monitored enclosures or if purge flow out of either enclosure exhaust port is lost. The X-Purge system also ensures that the system is safe before it permits power to be applied to the analyzer system. To ensure continued safe operation of the analyzer system, the X-Purge unit must not be disabled or adjusted improperly.

On power-up, the X-Purge system checks the purge pressure in all monitored enclosures and for flow exiting the exhaust ports of the enclosures. When all monitored enclosures register pressures at least

0.3 inch of water (0.75 mbar) above the reference pressure, adequate flow is present at the enclosure exhaust ports, and the instrument air pressure is greater than 10 psig, a time delay relay begins its timed cycle. Typically, the time delay is used to ensure that at least four volumes of air are exchanged in the enclosures before power is applied to the system. (The number of exchanged volumes may be higher in some situations.) After the preset time delay is accomplished, the time delay relay applies power to the analyzer system.

Typically, the X-Purge assembly is designed for monitoring two enclosure purge pressures and two exhaust port flows. All of the pressures in the monitored enclosures must be at least 0.3 inch of water (0.75 mbar) higher than the atmospheric pressure around the analyzer system. This ensures that hazardous materials are less likely to leak into the purged enclosures.

Pressure differential switches compare the pressure in the monitored enclosures with the pressure in the explosion proof X-Purge enclosure. The inside of the X-Purge enclosure is referenced to ambient pressure using a 1/4-inch breather drain with flame suppression. A flame arrestor is also installed between each pressure differential switch and the associated pressure enclosure that it monitors. A spark arrestor vent is used for exhaust purposes and to maintain appropriate backpressure on the electronic enclosure and oven.

For T3 or T4 ratings, a bottled air backup source supplies air for purging the instrument in the event that instrument air pressure is lost. Instruments with a T3 rating must be allowed to cool for at least 45 minutes before opening the oven door. Instruments with a T4 rating must be allowed to cool for at least 140 minutes before opening the oven door.

Caution Failure to allow adequate cooling before opening the oven can lead to injury of personnel or damage to equipment. ▲

Note Cable glands used to supply electrical power must be IP40 rated metallic cable glands. ▲

Note Blanking elements or plugs used shall be in accordance with national standards. ▲

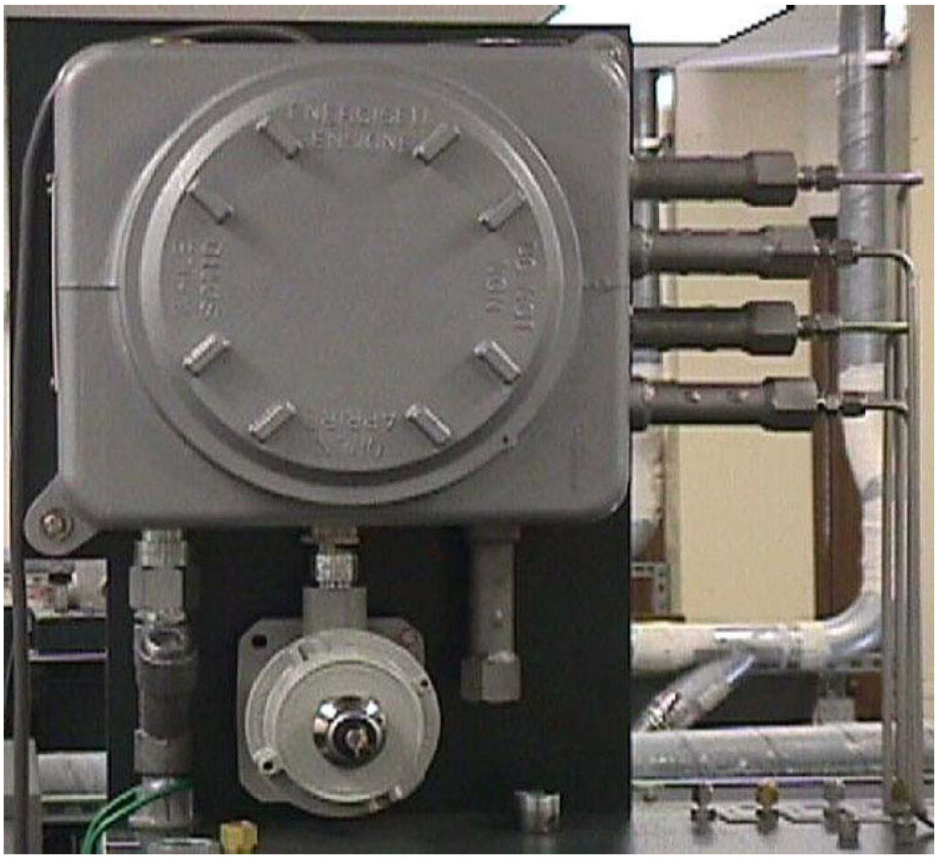

Figure F–1. Purge control unit (ATEX version shown. NFPA version has key switch inside enclosure)

X-Purge Specifications

Table F–1.

General specifications	
Certifications	CSA with C and US Mark: Class 1, Div. 1, Groups B, C, D hazardous areas ATEX: Zone 1, Ex px II T IECEx: Ex d[p] IIC T4
Programming	Programmable time delay
Function	Monitors two pressurized enclosures and two exhaust port flows

Table F–2. Normal conditions

Normal conditions	
Power	AC applied to X-Purge unit
Switches	Normal/Bypass: Set to NORMAL Time delay relay: Set to number of seconds for delay; time delay typically set from 480 to 600 seconds (see application notes for individual system)
X-Purge pressure	Minimum 10 psig
Oven air pressure	Minimum 10 psig or as specified in instrument application notes or system log books
Oven door	Closed tightly
Electronic housing door	Closed tightly
Instrument air ball valve for X-Purge unit	Open

Table F–3. Utility requirements

Utility requirements	
Instrument air	60–80 psig, 8 SCFM (maximum)
Instrument air quality	Water and oil free, -40°C (-40°F) dew point, particles < 5μ, ISA grade, hydrocarbon free
AC power	110 Vac, 50/60 Hz

Installation

Caution Before attempting to install the X-Purge controller, review all safety information in this manual and all other applicable documents. ▲

Caution Applicable permits must be obtained and appropriate precautions must be taken to prevent possible injury to personnel or equipment damage when installing the system. ▲

AC Power

AC power to the X-Purge is connected by the customer. Power wiring and circuit breakers must be sized appropriately. Refer to drawings provided with the system for connection information and power requirements.

Customers must provide a suitable power switch near the system for use by maintenance personnel.

Warning Electrical power must be free of spikes, sags, surges or electrical noise. ▲

AC power to any system using the X-Purge is connected directly to the X-Purge unit rather than the analyzer. The X-Purge unit controls the power to the instrument to ensure safe operation in hazardous areas. Consult the following table for ac power connections to the X-Purge unit.

Table F–4.

Power	Terminal
Hot	TB1-1[1]
Neutral	TB1-3[2]
Ground	TB1-5
Power out (switched)	TB1-6

[1] Terminals 1 and 2 are jumpered together.

[2] Terminals 3 and 4 are jumpered together.

CRRM0000153

Alarm Signal

The X-Purge provides dry alarm contacts. To use the alarm contacts, refer to the following connection table. The alarm contacts are rated for 10 A at 120 Vac (240 Vac for 240 Vac units).

Table F–5.

Alarm Terminal	Terminal #
Open on alarm (closed when power is applied to the analyzer system)	TB1-7
Common	TB1-8
Closed on alarm (closed when purge is lost or during fast purge of analyzer system)	TB1-9

Startup

The following procedure should be performed when starting up any analyzer system that uses the X-Purge system.

Caution Before initially starting the system, electrical power wiring must be checked for correct size and routing. All sample system plumbing must be thoroughly tested for leaks. ▲

Caution Do not open the explosion proof X-Purge enclosure in a hazardous area even when de-energized unless area has been properly tested and is known as being free from explosive gases. ▲

The following procedure only addresses the application of power to the system. Consult the start-up procedures in the instrument user's guide for additional requirements for system start-up.

1. Consult the start-up procedures in the instrument user's guide for general information on system start-up. All requirements prior to applying power to the system must be performed before proceeding to the rest of this procedure.
2. Open the instrument air supply to the analyzer.
3. Close the oven door securely and adjust the oven air pressure regulator to the value required for the analyzer (refer to the application notes or logbook for the analyzer).

4. Close the electronic enclosure door. Ensure that it is tightened securely.
5. Apply power to the X-Purge unit.
6. After the predetermined purge time, the X-Purge unit applies power to the analyzer system. Typically, this takes about 10 minutes, but it may vary depending upon the system. Refer to the system application notes or logbook for the correct purge time.

Caution Do not open the X-Purge housing unless power is removed from the X-Purge or the area is known to be non-hazardous. ▲

If the unit does not apply power to the analyzer system after the required length of time, check for the following possible problems:

a. Purge pressure at the analyzer purge pressure gauge is too low.
b. Oven heater air pressure regulators set too low.
c. Oven door open or leaking air.
d. Electronic enclosure door open or leaking air.

7. Complete the remaining steps listed in the start-up procedure included in the start-up instructions in the instrument user's guide.

Shutdown

The X-Purge unit automatically removes power from the analyzer system if the purge pressure becomes less than 0.3 inch of water (0.75 mbar) in any monitored zone or if enclosure exhaust airflow drops too low. It also automatically removes power from the analyzer if the instrument air pressure at the X-Purge regulator is lower than about 10 psig. To manually remove power from the system, perform the following steps.

1. Perform all shutdown steps listed in the shutdown procedure in the instrument user's guide up to the point where power is turned off to the system.
2. Remove power to the X-Purge system.
3. Complete the remaining shutdown steps listed in the applicable shutdown procedure in the instrument user's guide.

Power or Purge Loss Shutdown

If ac power or purge pressure is lost, the X-Purge unit shuts off power to the analyzer system. When the power or purge pressure is restored, the X-Purge begins the purge timer. After the required purge time is achieved, the X-Purge unit applies power to the analyzer system.

The X-Purge controller interrupts the incoming analyzer electrical power. Power to 4–20 mA outputs is interrupted upon loss of purge or power, as the analyzer powers these outputs. The device receiving discrete and/or Modbus signals from the analyzer may apply power. Consequently, the purged analyzer enclosure could contain powered wiring even when power to the analyzer is interrupted. To ensure that the purged analyzer enclosure contains only non-incendiary power upon interruption of main analyzer power, you may elect to implement one of the following:

- Install the appropriate Intrinsically Safe (IS) barriers on Modbus and/or discrete signals.
- Utilize the X-Purge's alarm contacts to drive interposing relays configured such that the Modbus and/or discrete signal wiring continuity is broken upon loss of main analyzer power.

Maintenance

Caution Placing the Normal/Bypass switch in the Bypass position disables safe operation of the system. The Bypass position is to be used only when required for maintenance and only if the area is non-hazardous. ▲

Caution Do not open the explosion proof housing for the X-Purge unless the area is known to be non-hazardous. ▲

Caution Do not leave the Normal/Bypass switch in the Bypass position after maintenance is completed. Do not leave the analyzer system unattended when the Normal/Bypass switch is in the Bypass position. Personnel must remove power from the system immediately if hazardous conditions are suspected. ▲

Timer Adjustment

The required time delay for safe operation is determined at the factory. Adjustment of the time delay should not normally be required. Do not adjust the time delay unless you are absolutely sure that you will not create a potentially hazardous situation.

Caution Do not open the explosion proof housing for the X-Purge unless the area is known to be non-hazardous or the power is removed from the X-Purge unit. ▲

Caution Do not decrease the timer setting lower than the value specified in the application notes provided with the system or lower than the initial setting when received from Thermo Scientific. ▲

Caution If the timer setting is too short, the analyzer system is not purged adequately before power is applied. This can result in equipment damage and injury to personnel. ▲

The time delay relay uses digital switches to set the length of delay before applying power to the analyzer system. The number of seconds for the delay can be determined by adding the numbers together for all switches that are set to the On position. (The switches are located on the top of the time delay relay inside the X-Purge housing.) For example, if switches 256, 128, 64, and 32 are On, the time delay is 8 minutes (i.e. 256 + 128 + 64 + 32 = 480 seconds). When replacing the time delay relay, the switches on the new relay must be set the same as on the relay being replaced.

Appendix G: PUVF Optical Bench

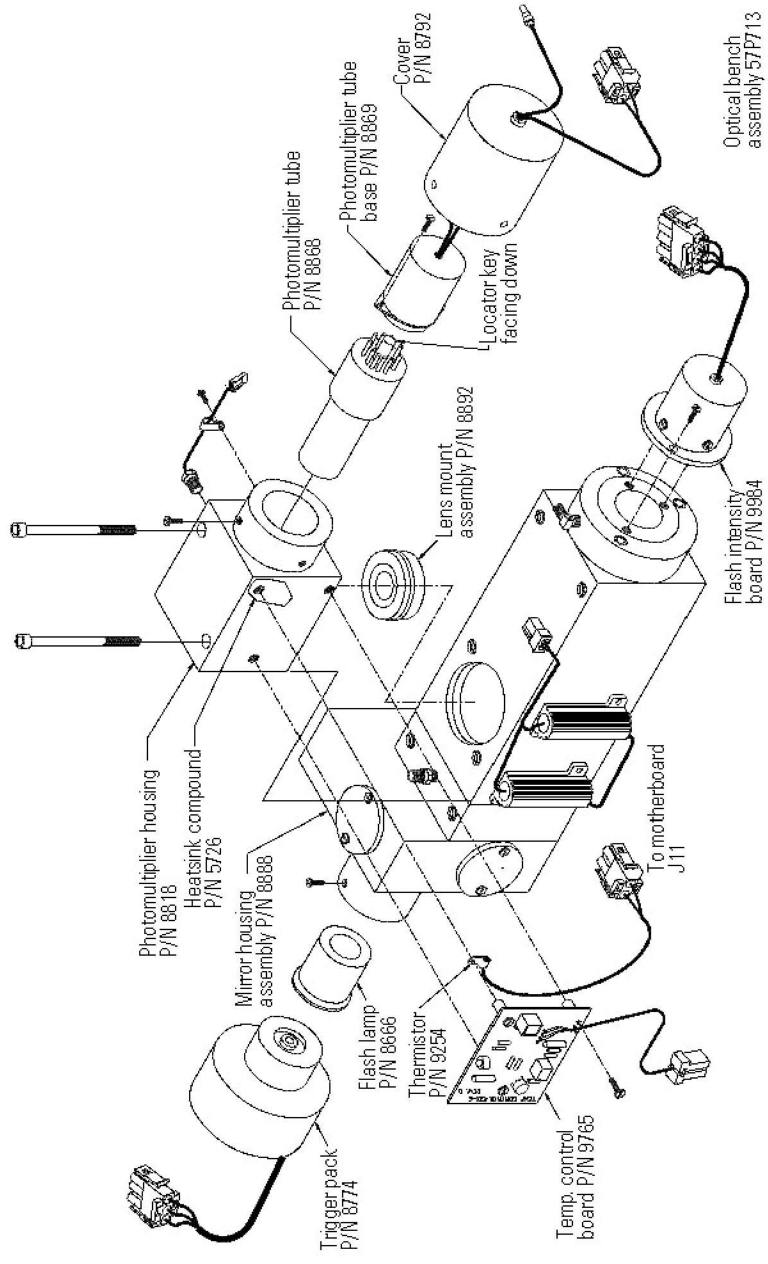

Figure G–1. Optical bench assembly exploded diagram, PN TE-57P713-1

Appendix H: Toxic & Hazardous Substances Tables

The English and Chinese versions of the Toxic and Hazardous Substances tables are shown below.

Table H–1. SOLA II Flare toxic & hazardous substances table

For Chinese Regulation: Administrative Measure on the Control of Pollution Caused by Electronic Information Products

Names and Content of Toxic and Hazardous Substances or Elements

Parts Name	Toxic and Hazardous Substances or Elements (SOLA-II)					
	Pb	Hg	Cd	Cr6+	PBB	PBDE
Housing	x	o	o	o	o	o
CPU Card	x	o	o	o	o	o
Removable Cards	x	o	o	o	o	o
Gage Assembly	x	o	o	o	o	o
Temperature Control	x	o	o	o	o	o
Band Strap Detector	x	o	o	o	o	o
Sensor Group	x	o	o	o	o	o
Furnace	o	o	o	o	o	o
AC/DC Distribution	x	o	o	o	o	o
Main Power Supply	x	o	o	o	o	o
Cabling	x	o	o	o	o	o

○ : Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in **SJ/T11363-2006**

x: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in **SJ/T11363-2006**

有毒有害物质名称及含量的标识格式

部件名称	有毒有害物质或元素 (SOLA-II)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳	x	o	o	o	o	o
CPU 电路板	x	o	o	o	o	o
可移动的卡片	x	o	o	o	o	o
量具组件	x	o	o	o	o	o
温度控制器	x	o	o	o	o	o
条带监测器	x	o	o	o	o	o
传感器组	x	o	o	o	o	o
熔炉	o	o	o	o	o	o
交流/直流配电	x	o	o	o	o	o
电源	x	o	o	o	o	o
缆线连接	x	o	o	o	o	o

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下

x: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求

Appendix I: Related Technical Bulletins

This appendix provides a list of technical bulletins related to this product as of the release date of this document revision. For the most current bulletins, please go to thermoscientific.com. Enter the product name (SOLA II Flare) as the search term and click the Resources tab.

Table I–1. Technical bulletins

TB #	Title
TB-0417-001	Replacing a Watlow® Series 93 Temperature Controller with a Watlow EZ-ZONE® PM6 Series Controller
TB-0417-003	Increasing the Lifetime of the Pyrolyzer Heater in a Thermo Scientific SOLA II Flare System
TB-0417-004	Using the Watlow® Series 93 Temperature Controller in a Thermo Scientific SOLA II Flare System
TB-0417-005	Replacing the Pyrolyzer Heater in the Thermo Scientific SOLA II Flare Analyzer

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